# Major Stormwater Management Plan
# (Major SWMP)
# For
# SANTA FE HEIGHTS

**Preparation/Revision Date:**
**May 13, 2011**

Prepared for:

Starwood Santa Fe Valley Partners
P.O. Box 2504
Rancho Santa Fe, CA 92067
Telephone: (858) 756-6300

Prepared by:

Raymond L. Martin
Vice-President
Hunsaker & Associates - San Diego, Inc.
9707 Waples Street
San Diego, CA 92121
Telephone: (858) 558-4500

The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan have been prepared under the direction of the following Registered Civil Engineer and meet the requirements of Regional Water Quality Control Board Order R9-2007-0001 and subsequent amendments.


Raymond L. Martin, RCE# 48670

Date

The Major Stormwater Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP, please reference the County's Stormwater Intake Form for Development Projects.

| | |
|---|---|
| Project Name: | Santa Fe Heights |
| Project Location: | The proposed Santa Fe Heights site is located north of Artesian Road, south of Top Of The Morning Way and west of Caminito Del Vientecito within the County of San Diego, California. |
| Permit Number (Land Development Projects): | |
| Work Authorization Number (**CIP only**): | |
| Applicant: | Starwood Santa Fe Partners |
| Applicant's Address: | P.O. Box 2504<br>Rancho Santa Fe, CA 92067 |
| Plan Prepared By *(Leave blank if same as applicant)*: | Hunsaker & Associates - San Diego, Inc. |
| Preparer's Address: | 9707 Waples<br>San Diego, CA 92121 |
| Date: | May 13, 2011 |

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9926) requires all applications for a permit or approval associated with a Land Disturbance Activity to be accompanied by a Storm Water Management Plan (SWMP) (section 67.806.b). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority development project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

| Project Stages | Does the SWMP need revisions? | | If YES, Provide Revision Date |
|---|---|---|---|
| | YES | NO | |
| Tentative Map (rev. 10/10/2006, rev. 4/4/2009) | X | | |
| | | | |
| | | | |

Instructions for a Major SWMP can be downloaded at
http://www.co.san-diego.ca.us/dpw/watersheds/susmp/susmppdf/susmp_manual.pdf

Completion of the following checklists and attachments will fulfill the requirements of a Major SWMP for the project listed above.

**STEP 1**

## PRIORITY DEVELOPMENT PROJECT DETERMINATION

## TABLE 1: IS THE PROJECT IN ANY OF THESE CATEGORIES?

| | | | |
|---|---|---|---|
| Yes ☐ | No ☒ | **A** | **Housing subdivision of 10 or more dwelling units.** Examples: single-family homes, multi-family homes, condominiums, and apartments. |
| Yes ☐ | No ☒ | **B** | **Commercial—greater than one acre.** Any development other than heavy industry or residential. Examples: hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; airfields; and other light industrial facilities. |
| Yes ☐ | No ☒ | **C** | **Heavy industry—greater than one acre.** Examples: manufacturing plants, food processing plants, metal working facilities, printing plants, and fleet storage areas (bus, truck, etc.). |
| Yes ☐ | No ☒ | **D** | **Automotive repair shops.** A facility categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. |
| Yes ☐ | No ☒ | **E** | **Restaurants.** Any facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is greater than 5,000 square feet. Restaurants where land development is less than 5,000 square feet shall meet all SUSMP requirements except for structural treatment BMP and numeric sizing criteria requirements and hydromodification requirements. |
| Yes ☐ | No ☒ | **F** | **Hillside development greater than 5,000 square feet.** Any development that creates 5,000 square feet of impervious surface and is located in an area with known erosive soil conditions, where the development will grade on any natural slope that is twenty-five percent or greater. |
| Yes ☐ | No ☒ | **G** | **Environmentally Sensitive Areas (ESAs).** All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands. |
| Yes ☐ | No ☒ | **H** | **Parking lots 5,000 square feet or more** or with 15 or more parking spaces and potentially exposed to urban runoff. |
| Yes ☒ | No ☐ | **I** | **Street, roads, highways, and freeways.** Any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles, and other vehicles. |
| Yes ☐ | No ☒ | **J** | **Retail Gasoline Outlets (RGOs)** that are: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. |

To use the table, review each definition A through K. If any of the definitions match, the project is a Priority Development Project. Note some thresholds are defined by square footage of impervious area created; others by the total area of the development. Please see special requirements for previously developed sites and project exemptions on page 6 of the County SUSMP.

**STEP 2**
**PROJECT STORMWATER QUALITY DETERMINATION**

Total Project Site Area 19.6 ac (Acres or $ft^2$)

Estimated amount of disturbed acreage: 8.23 (Acres or $ft^2$)
(If>1 acre, you must also provide a WDID number from the SWRCB) WDID: TBD

Complete A through C and the calculations below to determine the amount of impervious surface on your project before and after construction.

A. Total size of project site: 19.6 ac (Acres or $ft^2$

B. Total impervious area (including roof tops) before construction: 0.0 (Acres or $ft^2$)

C. Total impervious area (including roof tops) after construction: 1.66 (Acres or $ft^2$)

Calculate percent impervious before construction: B/A 0.0 %
Calculate percent impervious after construction: C/A 8.47 %

Please provide detailed descriptions regarding the following questions:

**TABLE 2: PROJECT SPECIFIC STORMWATER ANALYSIS**

| | |
|---|---|
| 1. | Please provide a brief description of the project. |

The proposed Santa Fe Heights site is located north of Artesian Road, south of Top Of The Morning Way and west of Caminito Del Vientecito within the County of San Diego, California (see Vicinity Map in Attachment A). The 19.6-acre property will consist of the grading of 8 single family pads with a servicing road and an internal drainage system.

| | |
|---|---|
| 2. | Describe the current and proposed zoning and land use designation. |

Per the County of San Diego, the current and proposed zoning and land use designation for this site is estate residential.

| | |
|---|---|
| 3. | Describe the pre-project and post-project topography of the project. (Show on Plan) |

Vegetated with annual grasses, the existing 19.6 acre site is a localized highpoint, draining flows via overland flow to the northern and southern boundaries. Runoff from the northern portion of the site drains to the receiving San Dieguito River and runoff from the southern portion of the site drains to Lusardi Creek.

In post-development condition, the site topography will be altered by the addition of graded pads and access street. However, with the exception of the driveways and streets, all onsite drainage patterns will generally match the pre-developed condition.

| | |
|---|---|
| 4. | Describe the soil classification, permeability, erodibility, and depth to groundwater for LID and Treatment BMP consideration. (Show on Plan). If infiltration BMPs are proposed, a Geotechnical Engineer must certify infiltration BMPs in Attachment E. |

According to the NRCS Web Soil Survey, the project soils consist of Huerhuero loam which is categorized as hydrologic soil type "D". Soil Type "D" soils have very slow infiltration rates and are considered to be the least permeable soil type. Infiltration is therefore not recommended for this site.

The K factor of soil indicates the susceptibility of a soil to sheet and rill erosion by water where soil erosivity increases with an increasing K factor. According to the NRCS Web Soil Survey, the K Factor for the soil is approximately 0.37. Values of K range from 0.02 (least erosive) to 0.69 (most erosive). The K value of 0.37 for this site is moderate when compared to this range of values. The erosion potential for the site is therefore medium.

Since no infiltration facilities are being proposed for this site, groundwater is not an issue for this development.

| | |
|---|---|
| 5. | Describe if contaminated or hazardous soils are within the project area. (Show on Plan) |

A complete soils report has not been performed at this time, but will accompany this report during final engineering. Due to the undeveloped nature of the project in the pre-developed condition, hazardous soils are not expected onsite.

| | |
|---|---|
| 6. | Describe the existing site drainage and natural hydrologic features. (Show on Plan) |

Vegetated with annual grasses, the existing 19.6 acre site is a localized highpoint, draining flows via overland flow to the northern, southern and western boundaries. Runoff from the northern portion of the site drains to the receiving San Dieguito River and runoff from the southern portion of the site drains to the receiving Lusardi Creek.

In post-development condition, the site topography will be altered by the addition of graded pads and access street. However, with the exception of the driveways and streets, all onsite drainage patterns will generally match the pre-developed condition. Each graded pad will collect and direct its runoff towards one of the site's outlet locations. Water Quality/Detention Basins located at the project boundary will help mitigate runoff prior to leaving the site.

| | |
|---|---|
| 7. | Describe site features and conditions that constrain, or provide opportunities for stormwater control, such as LID features. |

The site is located within a hilly area with a Type 'D' soil per the NRCS Web Soil Survey web site. This will not allow for infiltration facilities and limit the use of vegetative swales to flatter sloped areas.

Opportunities presented from the site design include large lots which will allow for more on-lot mitigation possibly through providing vegetative landscaped areas. Also, available open-spaced areas at the downstream portions of the site will allow room for placement of planter areas and/or vegetative swales.

| | |
|---|---|
| 8. | Is this project within the environmentally sensitive areas as defined on the maps in Appendix A of the *County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects?* |
| ☐ Yes | ☒ No |
| 9. | Is this an emergency project? |
| ☐ Yes | ☒ No |

**CHANNELS & DRAINAGES**

Complete the following checklist to determine if the project includes work in channels.

**TABLE 3: PROJECT SPECIFIC STORMWATER ANALYSIS**

| No. | **CRITERIA** | **YES** | **NO** | **N/A** | COMMENTS |
|---|---|---|---|---|---|
| 1. | Will the project include work in channels? | ☐ | ☒ | ☐ | If YES go to 2 If NO go to 13. |
| 2. | Will the project increase velocity or volume of downstream flow? | ☐ | ☐ | ☐ | If YES go to 6. |
| 3. | Will the project discharge to unlined channels? | ☐ | ☐ | ☐ | If YES go to. 6. |
| 4. | Will the project increase potential sediment load of downstream flow? | ☐ | ☐ | ☐ | If YES go to 6. |
| 5. | Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability? | ☐ | ☐ | ☐ | If YES go to 8. |
| 6. | Review channel lining materials and design for stream bank erosion. | ☐ | ☐ | ☐ | Continue to 7. |
| 7. | Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity. | ☐ | ☐ | ☐ | Continue to 8. |
| 8. | Include, where appropriate, energy dissipation devices at culverts. | ☐ | ☐ | ☐ | Continue to 9. |
| 9. | Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour. | ☐ | ☐ | ☐ | Continue to 10. |
| 10. | Include, if appropriate, detention facilities to reduce peak discharges. | ☐ | ☐ | ☐ | Continue to 11. |
| 11. | "Hardening" natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development. | ☐ | ☐ | ☐ | Continue to 12. |
| 12. | Provide other design principles that are comparable and equally effective. | ☐ | ☐ | ☐ | Continue to 13. |
| 13. | End | | | | |

**TEMPORARY CONSTRUCTION BMPS**

Please check the construction BMPs that may be implemented during construction of the project. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

- ☒ Silt Fence
- ☒ Fiber Rolls
- ☒ Street Sweeping and Vacuuming
- ☒ Storm Drain Inlet Protection
- ☒ Stockpile Management
- ☒ Solid Waste Management
- ☒ Stabilized Construction Entrance/Exit
- ☐ Dewatering Operations
- ☐ Vehicle and Equipment Maintenance
- ☐ Desilting Basin
- ☒ Gravel Bag Berm
- ☒ Sandbag Barrier
- ☒ Material Delivery and Storage
- ☒ Spill Prevention and Control
- ☒ Concrete Waste Management
- ☒ Water Conservation Practices
- ☒ Paving and Grinding Operations

☒ Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

## EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

Complete the checklist below to determine if a proposed project will pose an "exceptional threat to water quality," and therefore require Advanced Treatment Best Management Practices during the construction phase.

### TABLE 4: EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION
**Exemption potentially available for projects that require advanced treatment:**

| No. | CRITERIA | YES | NO | INFORMATION |
|---|---|---|---|---|
| 1. | Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity? Current 303d list may be obtained from the following site: http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/r9 06 303d reqtmdls.pdf | ☐ | ☒ | If YES, continue to 2.<br>If NO, go to 5. |
| 2. | Will the project disturb more than 5 acres, including all phases of the development? | ☐ | ☐ | If YES, continue to 3.<br>If NO, go to 5. |
| 3. | Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity? | ☐ | ☐ | If YES, continue to 4.<br>If NO, go to 5. |
| 4. | Will the project disturb soils with a predominance of USDA-NRCS Erosion factors $k_f$ greater than or equal to 0.4? | ☐ | ☐ | If YES, continue to 6.<br>If NO, go to 5. |
| 5. | Project is not required to use Advanced Treatment BMPs. | | | Document for Project Files by referencing this checklist. |
| 6. | Project poses an "exceptional threat to water quality" and is required to use Advanced Treatment BMPs. | ☐ | ☐ | Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria. |

**Exemption potentially available for projects that require advanced treatment:** Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that shows to the County official's satisfaction that advanced treatment is not required

**STEP 3**

## HYDROMODIFICATION DETERMINATION

The following questions provide a guide to collecting information relevant to hydromodification management issues.

### TABLE 5: HYDROMODIFICATION DETERMINATION

| | QUESTIONS | YES | NO | Information |
|---|---|---|---|---|
| 1. | Will the project reduce the pre-project impervious area and are the unmitigated post-project outflows (outflows without detention routing) to each outlet location less as compared to the pre-project condition? | ☐ | ☒ | If NO, continue to 2. If YES, go to 7. |
| 2. | Would the project site discharge runoff directly to an exempt receiving water, such as the Pacific Ocean, San Diego Bay, an exempt reservoir, or a tidally-influenced area? | ☐ | ☒ | If NO, continue to 3. If YES, go to 7. |
| 3. | Would the project site discharge to a stabilized conveyance system, which has the capacity for the ultimate Q 10, and extends to the Pacific Ocean, San Diego Bay, a tidally-influenced area, an exempt river reach or reservoir? | ☐ | ☒ | If NO, continue to 4. If YES, go to 7. |
| 4. | Does the contributing watershed area to which the project discharges have an impervious area percentage greater than 70 percent? | ☐ | ☒ | If NO, continue to 5. If YES, go to 7. |
| 5. | Is this an urban infill project which discharges to an existing hardened or rehabilitated conveyance system that extends beyond the "domain of analysis," where the potential for cumulative impacts in the watershed are low, and the ultimate receiving channel has a "Low" susceptibility to erosion as defined in the SCCWRP channel assessment tool? | ☐ | ☒ | If NO, continue to 6. If YES, go to 7. |
| 6. | Project is required to manage hydromodification impacts. | ☐ | ☐ | Reference Appendix G "Hydromodification Management Plan" of the County SUSMP. |
| 7. | Project is not required to manage hydromodification impacts. | ☒ | ☐ | Hydromodification Exempt. Keep on file. |

**STEP 4**

**POLLUTANTS OF CONCERN DETERMINATION**

WATERSHED

Please check the watershed(s) for the project.

| | | | |
|---|---|---|---|
| ☐ San Juan 901 | ☐ Santa Margarita 902 | ☐ San Luis Rey 903 | ☐ Carlsbad 904 |
| ☒ San Dieguito 905 | ☐ Penasquitos 906 | ☐ San Diego 907 | ☐ Sweetwater 909 |
| ☐ Otay 910 | ☐ Tijuana 911 | ☐ Whitewater 719 | ☐ Clark 720 |
| ☐ West Salton 721 | ☐ Anza Borrego 722 | ☐ Imperial 723 | |

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

**HYDROLOGIC SUB-AREA NAME AND NUMBER(S)**

| Number | Name |
|---|---|
| 905.11 | Rancho Santa Fe HSA |
| 905.12 | La Jolla HSA |

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

**SURFACE WATERS** that each project discharge point proposes to discharge to. List the impairments identified in Table 7.

| SURFACE WATERS (river, creek, stream, etc.) | Hydrologic Unit Basin Number | Impairment(s) listed [303(d) listed waters or waters with established TMDLs] | Distance to Project |
|---|---|---|---|
| San Dieguito River | 905.11 | | 0.6 miles |
| Lusardi Creek | 905.11 | | 0.8 miles |
| San Dieguito Lagoon | 905.11 | Bacteria | 6.4 miles |

http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/ 303dlists2006/epa/r9 06 303d reqtmdls.pdf

**GROUND WATERS**

| Ground Waters | Hydrologic Unit Basin Number | **MUN** | **AGR** | **IND** | **PROC** | **CWR** | **FRESH** | **POW** | **REC1** | **REC2** | **BIOL** | **WARM** | **COLD** | **WILD** | **RARE** | **SPWN** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solana Beach HA | 905.10 | • | • | • | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

+ Excepted from Municipal • Existing Beneficial Use ◦Potential Beneficial Use

**PROJECT ANTICIPATED AND POTENTIAL POLLUTANTS**

Using Table 6, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

**TABLE 6: ANTICIPATED AND POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE**

| | ***General Pollutant categories*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *PDP Categories* | Sediments | Nutrients | Heavy Metals | Organic Compounds | Trash & Debris | Oxygen Demanding Substances | Oil & Grease | Bacteria & Viruses | Pesticides |
| Detached Residential Development | X | X | | | X | X | X | X | X |
| Attached Residential Development | X | X | | | X | P(1) | P(2) | P | X |
| Commercial Development 1 acre or greater | P(1) | P(1) | | P(2) | X | P(5) | X | P(3) | P(5) |
| Heavy industry /industrial development | X | | X | X | X | X | X | | |
| Automotive Repair Shops | | | X | X(4)(5) | X | | X | | |
| Restaurants | | | | | X | X | X | X | |
| Hillside Development >5,000 $ft_2$ | X | X | | | X | X | X | | X |
| Parking Lots | P(1) | P(1) | X | | X | P(1) | X | | P(1) |
| Retail Gasoline Outlets | | | X | X | X | X | X | | |
| Streets, highways & Freeways | X | P(1) | X | X(4) | X | P(5) | | X | |

X = anticipated
P = potential
(1) A potential pollutant if landscaping exists on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.

## PROJECT POLLUTANTS OF CONCERN SUMMARY TABLE

Please summarize the identified project pollutants of concern by checking the appropriate boxes in the table below and list any surface water impairments identified. Pollutants anticipated to be generated by the project, which are also causing impairment of receiving waters, shall be considered the primary pollutants of concern. For projects where no primary pollutants of concern exist, those pollutants identified as anticipated shall be considered secondary pollutants of concern.

## TABLE 7: PROJECT POLLUTANTS OF CONCERN

| Pollutant Category | Anticipated (X) | Potential (P) | Surface Water Impairments |
|---|---|---|---|
| Sediments | X | | |
| Nutrients | X | X | |
| Heavy Metals | X | | |
| Organic Compounds | X | | |
| Trash & Debris | X | | |
| Oxygen Demanding Substances | X | X | |
| Oil & Grease | X | | |
| Bacteria & Viruses | X | | Bacteria: Water containing excessive bacteria and viruses can alter the aquatic habitat and create a harmful environment for humans and aquatic life. |
| Pesticides | X | | |

Based on Table 7, the primary pollutants of concern are bacteria. The secondary pollutants of concern are sediments, nutrients, heavy metals, organic compounds, trash & debris, oxygen demanding substances, oil & grease, and pesticides.

**STEP 5**

## LID AND SITE DESIGN STRATEGIES

Each numbered item below is a Low Impact Development (LID) requirement of the WPO. Please check the box(s) under each number that best describes the LID BMP(s) and Site Design Strategies selected for this project.

### TABLE 8: LID AND SITE DESIGN

| |
|---|
| 1. Conserve natural Areas, Soils, and Vegetation |
| ☐ Preserve well draining soils (Type A or B) |
| ☐ Preserve Significant Trees |
| ☒ Preserve critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions |
| ☐ Other. Description: |
| 2. Minimize Disturbance to Natural Drainages |
| ☐ Set-back development envelope from drainages |
| ☒ Restrict heavy construction equipment access to planned green/open space areas |
| ☐ Other. Description: |
| 3. Minimize and Disconnect Impervious Surfaces (see 5) |
| ☐ Clustered Lot Design |
| ☒ Items checked in 5? |
| ☐ Other. Description: |
| 4. Minimize Soil Compaction |
| ☒ Restrict heavy construction equipment access to planned green/open space areas |
| ☐ Re-till soils compacted by construction vehicles/equipment |
| ☐ Collect & re-use upper soil layers of development site containing organic Materials |
| ☐ Other. Description: |
| 5. Drain Runoff from Impervious Surfaces to Pervious Areas |
| LID Street & Road Design |
| ☒ Curb-cuts to landscaping |
| ☐ Rural Swales |
| ☐ Concave Median |
| ☐ Cul-de-sac Landscaping Design |
| ☐ Other. Description: |
| LID Parking Lot Design |
| ☐ Permeable Pavements |

| |
|---|
| ☐ Curb-cuts to landscaping |
| ☐ Other. Description: |
| LID Driveway, Sidewalk, Bike-path Design |
| ☐ Permeable Pavements |
| ☒ Pitch pavements toward landscaping |
| ☐ Other. Description: |
| LID Building Design |
| ☐ Cisterns & Rain Barrels |
| ☒ Downspout to swale |
| ☐ Vegetated Roofs |
| ☐ Other. Description: |
| LID Landscaping Design |
| ☐ Soil Amendments |
| ☐ Reuse of Native Soils |
| ☒ Smart Irrigation Systems |
| ☐ Street Trees |
| ☐ Other. Description: |
| 6. Minimize erosion from slopes |
| ☒ Disturb existing slopes only when necessary |
| ☐ Minimize cut and fill areas to reduce slope lengths |
| ☐ Incorporate retaining walls to reduce steepness of slopes or to shorten slopes |
| ☐ Provide benches or terraces on high cut and fill slopes to reduce concentration of flows |
| ☐ Rounding and shaping slopes to reduce concentrated flow |
| ☐ Collect concentrated flows in stabilized drains and channels |
| ☐ Other. Description: |

**STEP 6**

**SOURCE CONTROL**

Please complete the checklist on the following pages to determine Source Control BMPs. Below is instruction on how to use the checklist. (Also see instructions on page 42 of the *SUSMP)*

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.

2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your Source Control Exhibit in Attachment B.

3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in a table in your Project-Specific SUSMP.

4. Use the format in Table 9 below to summarize the project Source Control BMPs. Incorporate all identified Source Control BMPs in your Source Control Exhibit in Attachment B.

## TABLE 9: PROJECT SOURCE CONTROL BMPS

| Potential Sources of Pollutants | Permanent source control BMPs | Operational source control BMPs |
|---|---|---|
| On-site storm drain inlets | Mark all inlets with the words "No Dumping! Flows to Bay" or similar. | Maintain and periodically repaint or replace inlet markings.<br><br>Provide stormwater pollution prevention information to new site owners, lessees, or operators.<br><br>See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com<br><br>Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains." |
| Landscape/Outdoor Pesticide Use | Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.<br><br>Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.<br><br>Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.<br><br>To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions. | Maintain landscaping using minimum or no pesticides.<br><br>See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.<br><br>Provide IPM information to new owners, lessees and operators. |
| Miscellaneous Drain or Wash Water :<br>Rooftop Equipment, Water Roofing, gutters, and trim | Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment.<br><br>Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. | |
| Plazas, sidewalks and parking lots. | | Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain. |

Describe your specific Source Control BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting Source Control BMPs or substituting alternatives.

This project has incorporated a few permanent and operational source control BMP features in the site design. The Source Control Exhibit in Attachment B was prepared per the County of San Diego SUSMP Manual and details the source control BMPs to be used on this project.

There are strategic ways this site can promote water quality awareness. To discourage polluting, markings at catch basins and at curb cut locations could indicate that downstream storm drain outlets into receiving waters. Future homeowners within the site could also be made aware of the effects of polluting with literature distributed by the Homeowners Association or current owner.

Manufactured slopes should be landscaped with suitable ground cover or installed with an erosion control system. Homeowners should be educated as to the proper routine maintenance to landscaped areas including trimming, pruning, weeding, mowing, replacement or substitution of vegetation in ornamental and required landscapes. During landscaping operations both during and after construction, landscape maintenance should be completed proactively.

Permanent housing features like roofs, gutters, and trim could introduce potential pollutants by the mere material they are composed of. Specify that copper or any other unprotected metal is highly discouraged for the home construction since they will tend to leach into the runoff.

Litter or debris throughout the constructed site should be addressed and disposed as soon as possible via sweeping, raking, or pressure washing in order to prevent their accumulation. In addition, the discharge from pressure washing should be discharged into the sanitary sewer rather than the downstream storm drain.

| IF THESE SOURCES WILL BE ON THE PROJECT SITE… | …THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs | | |
|---|---|---|---|
| **1**<br>**Potential Sources of Runoff Pollutants** | **2**<br>**Permanent Controls – Show on Source Control Exhibit, Attachment B** | **3**<br>**Permanent Controls – List in SUSMP Table and Narrative** | **4**<br>**Operational BMPs – Include in SUSMP Table and Narrative** |
| ☒ **A.** On-site storm drain inlets | ☒ Location of inlets. | ☒ Mark all inlets with the words "No Dumping! Flows to Bay" or similar. | ☒ Maintain and periodically repaint or replace inlet markings.<br><br>☒ Provide stormwater pollution prevention information to new site owners, lessees, or operators.<br><br>☒ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com<br><br>☒ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains." |
| ☐ **B**. Interior floor drains and elevator shaft sump pumps | | ☐ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer. | ☐ Inspect and maintain drains to prevent blockages and overflow. |
| ☐ **C.** Interior parking garages | | ☐ State that parking garage floor drains will be plumbed to the sanitary sewer. | ☐ Inspect and maintain drains to prevent blockages and overflow. |

| IF THESE SOURCES WILL BE ON THE PROJECT SITE… | …THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs | | |
|---|---|---|---|
| **1**<br>**Potential Sources of Runoff Pollutants** | **2**<br>**Permanent Controls – Show on Source Control Exhibit, Attachment B** | **3**<br>**Permanent Controls – List in SUSMP Table and Narrative** | **4**<br>**Operational BMPs – Include in SUSMP Table and Narrative** |
| ☐ **D.** Need for future indoor & structural pest control | | ☐ Note building design features that discourage entry of pests. | ☐ Provide Integrated Pest Management information to owners, lessees, and operators. |

| IF THESE SOURCES WILL BE ON THE PROJECT SITE… | …THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs | | |
|---|---|---|---|
| **1**<br>**Potential Sources of Runoff Pollutants** | **2**<br>**Permanent Controls – Show on Source Control Exhibit, Attachment B** | **3**<br>**Permanent Controls – List in SUSMP Table and Narrative** | **4**<br>**Operational BMPs – Include in SUSMP Table and Narrative** |
| ☒ **D2.** Landscape/ Outdoor Pesticide Use<br><br>Note: Should be consistent with project landscape plan (if applicable). | ☐ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.<br><br>☐ Show self-retaining landscape areas, if any.<br><br>☒ Show stormwater treatment facilities | State that final landscape plans will accomplish all of the following:<br><br>☒ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.<br><br>☒ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.<br><br>☒ Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.<br><br>☐ Consider using pest-resistant plants, especially adjacent to hardscape.<br><br>☒ To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions. | ☒ Maintain landscaping using minimum or no pesticides.<br><br>☒ See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.<br><br>☒ Provide IPM information to new owners, lessees and operators. |

| IF THESE SOURCES WILL BE ON THE PROJECT SITE… | …THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs | | |
|---|---|---|---|
| **1**<br>**Potential Sources of Runoff Pollutants** | **2**<br>**Permanent Controls – Show on Source Control Exhibit, Attachment B** | **3**<br>**Permanent Controls – List in SUSMP Table and Narrative** | **4**<br>**Operational BMPs – Include in SUSMP Table and Narrative** |
| ☐ **E.** Pools, spas, ponds decorative fountains, and other water features. | ☐ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. | ☐ If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements. | ☐ See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com |
| ☐ **F**. Food service | ☐ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.<br><br>☐ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer. | ☐ Describe the location and features of the designated cleaning area.<br><br>☐ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated. | ☐ |

| IF THESE SOURCES WILL BE ON THE PROJECT SITE… | …THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs | | |
|---|---|---|---|
| **1**<br>**Potential Sources of Runoff Pollutants** | **2**<br>**Permanent Controls – Show on Source Control Exhibit, Attachment B** | **3**<br>**Permanent Controls – List in SUSMP Table and Narrative** | **4**<br>**Operational BMPs – Include in SUSMP Table and Narrative** |
| ☐ **G.** Refuse areas | ☐ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.<br><br>☐ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.<br><br>☐ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer. | ☐ State how site refuse will be handled and provide supporting detail to what is shown on plans.<br><br>☐ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar. | ☐ State how the following will be implemented:<br><br>Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on- site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com |
| ☐ **H**. Industrial processes. | ☐ Show process area. | ☐ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system." | ☐ See Fact Sheet SC-10, "Non Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com |

| IF THESE SOURCES WILL BE ON THE PROJECT SITE… | …THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs | | |
|---|---|---|---|
| **1**<br>**Potential Sources of Runoff Pollutants** | **2**<br>**Permanent Controls – Show on Source Control Exhibit, Attachment B** | **3**<br>**Permanent Controls – List in SUSMP Table and Narrative** | **4**<br>**Operational BMPs – Include in SUSMP Table and Narrative** |
| ☐ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.) | ☐ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.<br><br>☐ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.<br><br>☐ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site. | ☐ Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.<br><br>Where appropriate, reference documentation of compliance with the requirements of local Hazardous Materials Programs for:<br>▪ Hazardous Waste Generation<br>▪ Hazardous Materials Release Response and Inventory<br>▪ California Accidental Release (CalARP)<br>▪ Aboveground Storage Tank<br>▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991<br>Underground Storage Tank | ☐ See Fact Sheet SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com |

| | | | |
|---|---|---|---|
| ☐ **J.** Vehicle and Equipment Cleaning | ☐ Show on drawings as appropriate:<br><br>(1) Commercial/industrial facilities having vehicle /equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.<br><br>(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shutoff to discourage such use).<br><br>(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.<br><br>(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed. | ☐ If a car wash area is not provided, describe measures taken to discourage on-site car washing and explain how these will be enforced. | Describe operational measures to implement the following (if applicable):<br><br>☐ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.<br><br>☐ Car dealerships and similar may rinse cars with water only.<br><br>☐ See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com |

| | | | |
|---|---|---|---|
| ☐ **K.** Vehicle/Equipment Repair and Maintenance | ☐ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.<br><br>☐ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.<br><br>☐ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained. | ☐ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.<br><br>☐ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.<br><br>☐ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. | In the SUSMP report, note that all of the following restrictions apply to use the site:<br><br>☐ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.<br><br>☐ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.<br><br>☐ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. |

| | | | |
|---|---|---|---|
| ☐ **L.** Fuel Dispensing Area | ☐ Fueling areas[1] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable<br><br>☐ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area. | | ☐ The property owner shall sweep the fueling area routinely.<br><br>☐ See the Business Guide Sheet, "Automotive Service - Service, Stations" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com. |

[1] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

| | | | |
|---|---|---|---|
| ☐ **M.** Loading Docks | ☐ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas should be drained to the sanitary sewer where feasible. Direct connections to storm drains from depressed loading docks are prohibited.<br><br>☐ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.<br><br>☐ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer. | | ☐ Move loaded and unloaded items indoors as soon as possible<br><br>☐ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com |
| ☐ **N**. Fire Sprinkler Test Water | | ☐ Provide a means to drain fire sprinkler test water to the sanitary sewer. | ☐ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com |

| | | | |
|---|---|---|---|
| ☒ **O.** Miscellaneous Drain or Wash Water<br>☐ Boiler drain lines<br>☐ Condensate drain lines<br>☒ Rooftop equipment<br>☐ Drainage sumps<br>☒ Roofing, gutters, and trim | | ☐ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.<br>☐ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm dram system.<br>☒ Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment.<br>☐ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.<br>☒ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. | |
| ☒ **P**. Plazas, sidewalks and parking lots. | | | ☒ Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain. |

**STEP 7**

## LID AND TREATMENT CONTROL SELECTION

A treatment control BMP and/or LID facility must be selected to treat the project pollutants of concern identified in Table 7 "Project Pollutants of Concern". A treatment control facility with a high or medium pollutant removal efficiency for the project's most significant pollutant of concern shall be selected. It is recommended to use the design procedure in Chapter 4 of the SUSMP to meet NPDES permit LID requirements, treatment requirements, and flow control requirements. If your project does not utilize this approach, the project will need to demonstrate compliance with LID, treatment and flow control requirements. Review Chapter 2 "Selection of Stormwater Treatment Facilities" in the SUSMP to assist in determining the appropriate treatment facility for your project.

| Will this project be utilizing the unified LID design procedure as described in Chapter 4 of the Local SUSMP? *(If yes, please document in Attachment D following the steps in Chapter 4 of the County SUSMP)* | |
|---|---|
| Yes | No (circled) |

If this project is not utilizing the unified LID design procedure, please describe how the alternative treatment facilities will comply with applicable LID criteria, stormwater treatment criteria, and hydromodification management criteria.

This project does not propose bioretention, or the similar BMPs listed in Chapter 4 that use the unified LID design procedure, but instead proposes to use water quality basins as alternative treatment facilities that use an alternative sizing method other than the unified LID design procedure that includes sizing factors.

The vegetated swale used to treat the impervious areas from Lot 3 was designed using flow-based calculations for the 85$^{th}$ percentile flow rate. This flow rate was then used with Manning's Equation and an overall vegetated swale design to obtain a flow velocity. The required swale length for the project was calculated by multiplying the 85$^{th}$ percentile velocity by the minimum required retention time of 10 minutes.

Three water quality basins are proposed to treat the remainder of the project. Darcy's equation was used to calculate the bottom surface area of the proposed water quality basins, and is described on page F34 of the County of San Diego Treatment BMP Design Guidelines. Darcy's equation is a simple proportional relationship between the flow rate of water through a porous medium and the pressure drop of water. The equation calculates the required bottom surface area of a basin, which is the medium through which the water filters.

According to Table F-4 of the County of San Diego Treatment BMP Design Guidelines, the existing project soil has a hydraulic conductivity of approximately 0.15 in/hr (assuming a sandy clay loam). Since this value is very low, the proposed water quality basins will use engineered soil with better filtration capabilities, which will be finalized during final engineering. For preliminary purposes, the water quality basins were designed using a minimum recommended hydraulic conductivity of 0.5 in/hr, as recommended by Table F-4 of the County of San Diego Treatment BMP Design Guidelines (See table below).

The DMA calculations were performed as recommended in the County of San Diego SUSMP.

**TABLE F-4: TYPICAL INFILTRATION RATES FOR NRCS TYPE AND HSG CLASSIFICATIONS**

| NRCS Soil Type | HSG Classification | Infiltration Rate | |
|---|---|---|---|
| | | cm/hr | (in/hr) |
| Sand | A | 2.0 | (8.0) |
| Loamy sand | A | 5.1 | (2.0) |
| Sandy loam | B | 2.5 | (1.0) |
| Loam | B | 1.3* | (0.5)* |
| Silt loam | C | 0.6 | (0.25) |
| Sandy clay loam | C | 0.4 | (0.15) |
| Clay loam & silty clay loam | D | <0.2 | (<0.09) |
| Clays | D | <0.1 | (<0.05) |

* Minimum rate for infiltration basins. Silt loams may also be acceptable (HSG C) if geotechnical investigations demonstrate adequate infiltration rates.

► Indicate the project pollutants of concern (POCs) from Table 7 in Column 2 below.

**TABLE 10: GROUPING OF POTENTIAL POLLUTANTS of Concern (POCs) by fate during stormwater treatment**

| Pollutant | Check Project Specific POCs | Course Sediment and Trash | Pollutants that tend to associate with fine particles during treatment | Pollutants that tend to be dissolved following treatment |
|---|---|---|---|---|
| Sediment | X | X | X | |
| Nutrients | X | | X | X |
| Heavy Metals | X | | X | |
| Organic Compounds | X | | X | |
| Trash & Debris | X | X | | |
| Oxygen Demanding | X | | X | |
| Bacteria | X | | X | |
| Oil & Grease | X | | X | |
| Pesticides | X | | X | |

- Bacteria is the only primary pollutant of concern for this project.

► Indicate the treatment facility(s) chosen for this project in the following table.

**TABLE 11: GROUPS OF POLLUTANTS and relative effectiveness of treatment facilities**

| Pollutants of Concern | Bioretention Facilities (LID) | Settling Basins (Dry Ponds) | Wet Ponds and Constructed Wetlands | Infiltration Facilities or Practices (LID) | Media Filters | Higher-rate biofilters* | Higher-rate media filters* | Trash Racks & Hydro -dynamic Devices | Vegetated Swales |
|---|---|---|---|---|---|---|---|---|---|
| Course Sediment and Trash | High | High | High | High | High | High | High | High | High |
| Pollutants that tend to associate with fine particles during treatment | High | High | High | High | High | Medium | Medium | Low | Medium |
| Pollutants that tend to be dissolved following treatment | Medium | Low | Medium | High | Low | Low | Low | Low | Low |

► Please check the box(s) that best describes the Treatment BMP(s) and / or LID BMP selected for this project.

**TABLE 12: PROJECT LID AND TC-BMPS**

| |
|---|
| **Bioretention Facilities (LID)** |
| ☐ Bioretention area |
| ☐ Flow-through Planter |
| ☐ Cistern with Bioretention Facility |
| **Settling Basins (Dry Ponds)** |
| ☐ Extended / dry detention basin with grass / vegetated lining |
| ☐ Extended / dry detention basin with impervious lining |
| **Infiltration Facilities or Practices (LID)** |
| ☐ Infiltration basin |
| ☐ Dry well |
| ☐ Infiltration trench |
| **Wet Ponds and Constructed Wetlands** |
| ☐ Wet pond / basin (permanent pool) |
| ☐ Constructed wetland |
| **Vegetated Swales (LID [(1)])** |
| ☒ Vegetated Swale |

| **Media Filters** |
|---|
| ☐ Austin Sand Filter |
| ☐ Delaware Sand Filter |
| ☐ Multi-Chambered Treatment Train (MCTT) |
| **Higher-rate Biofilters** |
| ☐ Tree-pit-style unit |
| ☒ Other Water Quality Basins . |
| **Higher-rate Media Filters** |
| ☐ Vault-based filtration unit with replaceable cartridges |
| ☐ Other _____ |
| **Hydrodynamic Separator Systems** |
| ☐ Swirl Concentrator |
| ☐ Cyclone Separator |
| **Trash Racks** |
| ☐ Catch Basin Insert |
| ☐ Catch Basin Insert w/ Hydrocarbon boom |
| ☐ Other _____ |
| **Self-Treating or Self-Retaining Areas (LID)** |
| ☐ Pervious Pavements |
| ☐ Vegetated Roofs |
| ☐ Other _____ |

(1) Must be designated per SUSMP "Vegetated Swales" design criteria for LID credit (p. 65).

For design guidelines and calculations refer to Chapter 4 "Low Impact Development Design Guide" in the SUSMP. Please show all calculations and design sheets for all treatment facilities proposed in Attachment D.

► Create a Construction Plan SWMP Checklist for your project.

Instructions on how to fill out table

1. Number and list each measure or BMP you have specified in your SWMP in Columns 1 and Maintenance Category in Column 3 of the table. Leave Column 2 blank.

2. When you submit construction plans, duplicate the table (by photocopy or electronically). Now fill in Column 2, identifying the plan sheets where the BMPs are shown. List all plan sheets on which the BMP appears. This table must be shown on the front sheet of the grading and improvement plans.

| Stormwater Treatment Control and LID BMPs | | | |
|---|---|---|---|
| Description / Type | Sheet | Maintenance Category | Revisions |
| Water quality basins | | Category 2 | |
| Vegetated Swale | | Category 1 | |
| | | | |
| | | | |
| | | | |

* BMP's approved as part of Stormwater Management Plan (SWMP) dated xx/xx/xx on file with DPW. Any changes to the above BMP's will require SWMP revision and Plan Change approvals.

► Please describe why the chosen treatment BMP(s) was selected for this project. For project utilizing a low performing BMP, please provide a feasibility analysis that demonstrates utilization of a treatment facility with a high or medium removal efficiency ranking is infeasible.

Three water quality basins and a vegetated swale were chosen as the treatment control BMPs for this site because of their effectiveness in removing pollutants of concern. The open space available at the outlet locations allows the placement of water quality basins for the capture and treatment of all onsite impervious areas with the exception of Lot 3. The impervious areas from Lot 3 will receive treatment via a proposed on-lot vegetated swale prior to draining towards the existing culvert located at the northeast corner of the site.

Please provide the sizing design calculations for each Drainage Management Area in **Attachment D**. Guidelines for design calculations are located in Chapter 4 of the County SUSMP. To assist in these calculations a BMP sizing calculator is available for use at the following location: http://www.projectcleanwater.org/html/wg_susmp.html.

**STEP 8**

## OPERATION AND MAINTENANCE

► Please check the box that best describes the maintenance mechanism(s) for this project.

### TABLE 13: PROJECT BMP CATEGORY

| CATEGORY | SELECTED | | BMP Description |
|---|---|---|---|
| | YES | NO | |
| First | X | | Vegetated Swale<br>Water quality basins |
| Second[1] | X | | |
| Third[2] | | X | |
| Fourth | | X | |

Note:

1. A maintenance notification will be required.
2. A recorded maintenance agreement and access easement will be required.
3. The project will be required to establish or be included in a watershed specific Community Facility District (CFD) for long-term maintenance.
4. The developer would be required to dedicate the BMP (and the property on which it is located and any necessary access) to the County.

► Please list all individual LID and Treatment Control BMPs (TC-BMPs) incorporated into the project. Please ensure the "BMP Identifier" is consistent with the legend in Attachment C "Drainage Management Area Exhibit". Please attach the record plan sheets upon completion of project and amend the Major SWMP where appropriate. For each type of LID or TC-BMP provide an inspection sheet in Attachment F "Maintenance Plan".

### TABLE 14: PROJECT SPECIFIC LID AND TC-BMPS

| BMP Identifier* (Identifier to match TC-BMPs on TC-BMP Table.) | Type | Record Plan Page for TC-BMP | BMP Pollutant of Concern Efficiency (H,M,L) |
|---|---|---|---|
| Water Quality Basins | Higher-Rate Biofilters | TBD | (H, M, L) |
| Vegetated Swale | CASQA TC-30 | TBD | (H, M, L) |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

*For location of BMPs, see approved Record Plan dated XX/XX/XX, plan (TYPE) sheet (#).

► Responsible Party for Long-term Maintenance

Identify the parties responsible for long-term maintenance of the BMPs identified above and Source Controls specified in Attachment B. Include the appropriate written agreement with the entities responsible for O&M in Attachment F. Please see Chapter 5 "Private Ownership and Maintenance" on page 94 of the County SUSMP for appropriate maintenance mechanisms.

| |
|---|
| Representative Name: Noel Humphrey |
| Company Name: Starwood Santa Fe Valley Partners |
| Phone Number: (858) 756-6300 |
| Street Address: P.O. Box 2504 |
| City / State / Zip: Rancho Santa Fe, CA 92067 |
| Email Address: |

► Funding Source

Provide the funding source or sources for long-term operation and maintenance of each BMP identified above. Please see Chapter 5 "Stormwater Facility Maintenance" of the County SUSMP for the appropriate funding source options. By certifying the Major SWMP, the applicant is certifying that the funding responsibilities have been addressed and will be transferred to future owners.

Maintenance of the site BMPs will be the responsibility of Starwood Santa Fe Valley Partners and to be funded by Starwood Santa Fe Valley Partners until a formal agreement with a local HOA is developed. A maintenance plan will be developed and will include the following information:

Specification of routine and non-routine maintenance activities to be performed.

A schedule for maintenance activities.

Name, qualifications, and contact information for the parties responsible for maintaining the BMPs

**ATTACHMENTS**

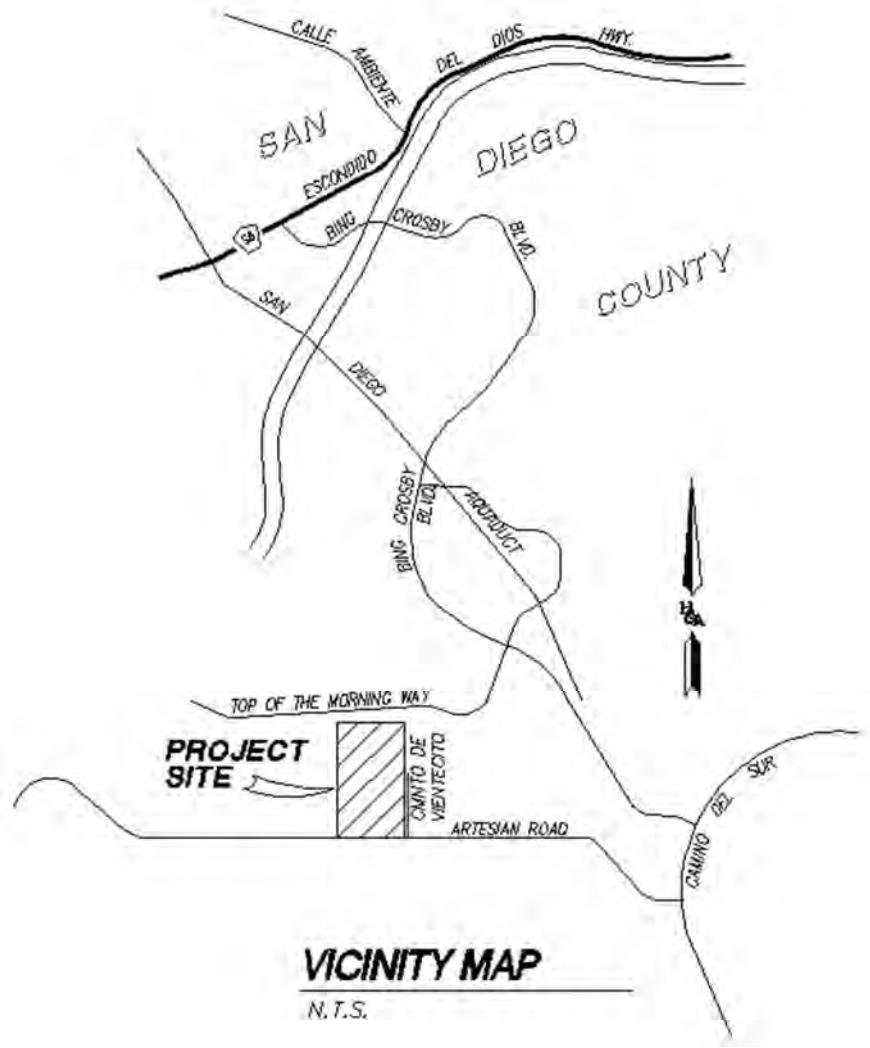
Please include the following attachments.

| ATTACHMENT | | COMPLETED | N/A |
|---|---|---|---|
| A | Project Location Map | ☒ | ☐ |
| B | Source Control Exhibit | ☒ | ☐ |
| C | Drainage Management Area (DMA)Exhibit | ☒ | ☐ |
| D | BMP Sizing Design Calculations (Water Quality and Hydromodification) and TC-BMP/IMP Design Details | ☒ | ☐ |
| E | Geotechnical Certification Sheet | ☐ | ☒ |
| F | Maintenance Plan | ☒ | ☐ |
| G | Treatment Control BMP Certification | ☒ | ☐ |
| H | HMP Exemption Documentation | ☐ | ☒ |
| I | Addendum | ☒ | ☐ |

Note: Attachments B and C may be combined.

# ATTACHMENT A

## Project Location Map



# ATTACHMENT B

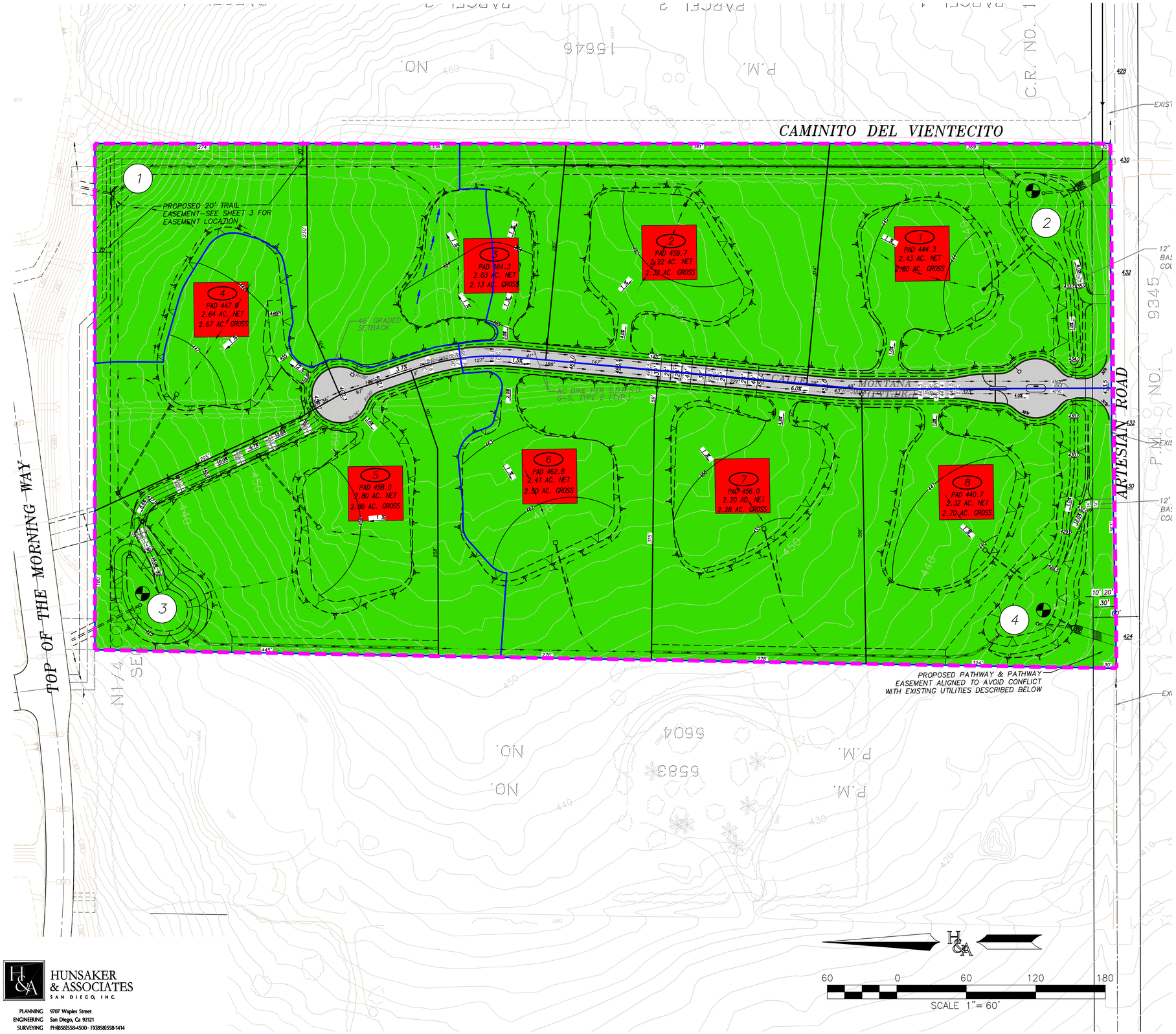
## Source Control Exhibit

Source and Source Control BMP Checklist

| Potential Sources of Pollutants | Permanent source control BMPs | Operational source control BMPs |
|---|---|---|
| On-site storm drain inlets | Mark all inlets with the words "No Dumping! Flows to Bay" or similar. | Maintain and periodically repaint or replace inlet markings.<br><br>Provide stormwater pollution prevention information to new site owners, lessees, or operators.<br><br>See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com<br><br>Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains." |
| Landscape/Outdoor Pesticide Use | Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.<br><br>Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.<br><br>Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.<br><br>To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions. | Maintain landscaping using minimum or no pesticides.<br><br>See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.<br><br>Provide IPM information to new owners, lessees and operators. |
| Miscellaneous Drain or Wash Water :<br>Rooftop Equipment, Water Roofing, gutters, and trim | Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment.<br><br>Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. | |
| Plazas, sidewalks and parking lots. | | Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain. |

# ATTACHMENT C

## Drainage Management Area (DMA) Exhibit




# LEGEND

OVERALL DRAINAGE BOUNDARY

BMP SUBAREA BOUNDARY

BMP SUBAREA DESIGNATION (2)

FLOW DIRECTION

DRAINAGE MANAGEMENT AREAS (DMA)

DMA #1 - SELF-TREATING LANDSCAPED AREAS
AREA = 783,589 SQ FT

DMA #2 - ROAD -
DRAINS TO ALTERNATIVE IMP
(WQ BASIN) AREA = 32,363 SQ FT

DMA #3 - ROOFTOPS/DRIVEWAYS - DRAINS TO ALTERNATIVE IMPs (SWALES, WQ BASIN)
AREA = 40,000 SQ FT

TREATMENT CONTROL BMPs (ALTERNATIVE IMPs)

WATER QUALITY (WQ) BASIN

VEGETATED SWALE

LID/SITE DESIGN BMPs

CURB-CUTS TO LANDSCAPING

DOWNSPOUT TO SWALES

SMART IRRIGATION SYSTEMS

MINIMIZE SLOPE EROSION

SOURCE CONTROL BMPs

Source and Source Control BMP Checklist

| Potential Sources of Pollutants | Permanent source control BMPs | Operational source control BMPs |
|---|---|---|
| On-site storm drain inlets | Mark all inlets with the words "No Dumping! Flows to Bay" or similar. | Maintain and periodically repaint or replace inlet markings.<br><br>Provide stormwater pollution prevention information to new site owners, lessees, or operators.<br><br>See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com<br><br>Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains." |
| Landscape/Outdoor Pesticide Use | Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.<br><br>Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.<br><br>To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions. | Maintain landscaping using minimum or no pesticides.<br><br>See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.<br><br>Provide IPM information to new owners, lessees and operators. |
| Miscellaneous Drain or Wash:<br>Water Roofing, gutters, and trim | Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment.<br><br>Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. | |
| Plazas, sidewalks and parking lots. | | Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain. |

HUNSAKER & ASSOCIATES
SAN DIEGO, INC
PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

R:\0905\&Hyd\ACAD\0905-DMA.dwg[]Jul-01-2011:13:19

# DRAINAGE MANAGEMENT AREA MAP

# SANTA FE HEIGHTS

SAN DIEGO COUNTY, CALIFORNIA

SHEET 1 OF 1

# ATTACHMENT D

## Sizing Design Calculations and TC-BMP/LID Design Details

PROJECT NAME: SANTA FE HEIGHTS
PROJECT LOCATION: SAN DIEGO COUNTY
85TH PERCENTILE PRECIPITATION DEPTH (IN): 0.65

| BMP AREA 1 | | | | | | |
|---|---|---|---|---|---|---|
| TOTAL DRAINAGE AREA : | AREA (SQ FT) | AREA (AC) | | | | |
| | 126,324 | 2.90 | | | | |
| I. SELF-TREATING AREAS | | | | | | |
| SELF-TREATING VEGETATED/LANDSCAPED AREAS | | | | | | |
| DMA NAME | SURFACE TYPE | DMA AREA (SQ FT) | DMA AREA (AC) | DMA RUNOFF FACTOR | 85TH PERCENTILE PRECIPITATION DEPTH (IN) | 85TH PERCENTILE FLOW (CFS) |
| 1 | VEGETATED | 121,968 | 2.80 | 0.1 | 0.65 | 0.06 |
| II. AREAS DRAINING TO IMPs | | | | | | |
| ROOFS, SIDEWALKS, AND STREETS DRAINING TO IMPS (BASIN) | | | | | | |
| DMA NAME | SURFACE TYPE | DMA AREA (SQ FT) | DMA AREA (AC) | DMA RUNOFF FACTOR | 85TH PERCENTILE PRECIPITATION DEPTH (IN) | 85TH PERCENTILE FLOW (CFS) |
| 2 | PAVED | 4,356 | 0.10 | 1 | 0.65 | 0.02 |

| ALTERNATIVE IMP SIZING FOR VEGETATED SWALE #1 | | |
|---|---|---|
| Total 85th Percentile flow | 0.08 | cfs |
| Ponding Depth | 0.25 | ft |
| Velocity | 0.2 | ft/s |
| Minimum Desired Retention Time | 10.0 | min. |
| **Minimum Required Total Swale Length **** | **102** | **ft** |
| **Total Proposed Swale Length** | **105** | **ft** |

* FROM HYDRAFLOW EXPRESS CALCULATIONS

** Length = Velocity * Retention Time * 60

# Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Monday, Mar 21 2011

## Vegetated Swale - BMP #1

**Trapezoidal**

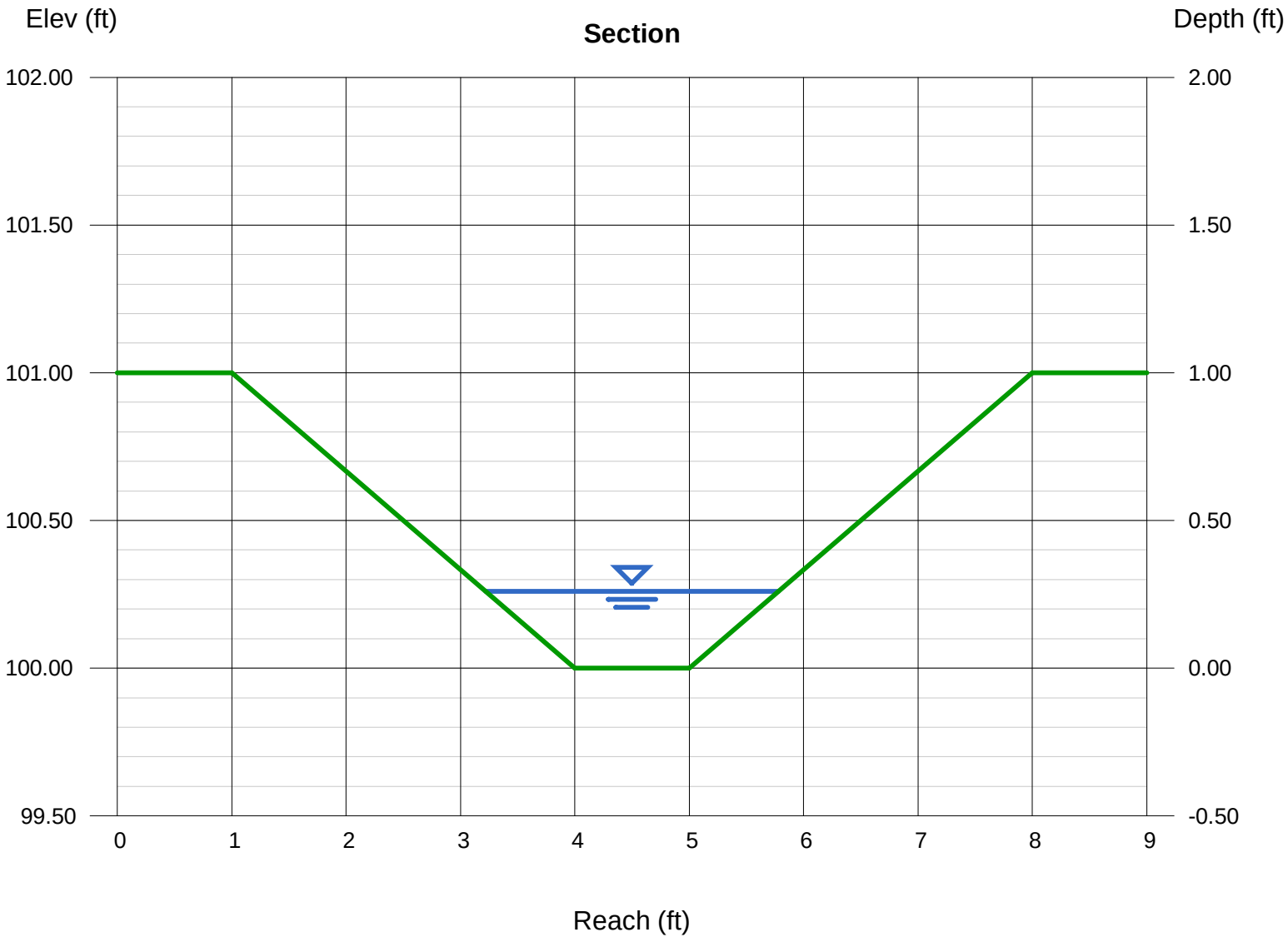
| | |
|---|---|
| Bottom Width (ft) | = 1.00 |
| Side Slopes (z:1) | = 3.00, 3.00 |
| Total Depth (ft) | = 1.00 |
| Invert Elev (ft) | = 100.00 |
| Slope (%) | = 1.00 |
| N-Value | = 0.250 |

**Calculations**

| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cfs) | = 0.08 |

**Highlighted**

| | |
|---|---|
| Depth (ft) | = 0.26 |
| Q (cfs) | = 0.080 |
| Area (sqft) | = 0.46 |
| Velocity (ft/s) | = 0.17 |
| Wetted Perim (ft) | = 2.64 |
| Crit Depth, Yc (ft) | = 0.06 |
| Top Width (ft) | = 2.56 |
| EGL (ft) | = 0.26 |



**Bioretention Basin with Subdrain Surface Area Formula**

$SA = (SF*V*Df) / [K*t*(Dp/12+Df)]$

SA = Required surface area (sq ft)
V = 85th Percentile volume (cu ft)
K = Infiltration rate (in/hr)
t = Infiltration time (hr)
SF= Safety factor
Dp = Depth of surface ponding (ft)
Df = Depth of media filter (ft)

85th Percentile Runoff Volume

$V = C * d * A$

V = Runoff volume (cu ft)
C = Weighted runoff coefficient
d = 85th percentile precipitation depth (ft)
A = Tributary area (sq ft)

PROJECT NAME: SANTA FE HEIGHTS
PROJECT LOCATION: SAN DIEGO COUNTY
85TH PERCENTILE PRECIPITATION DEPTH (IN): 0.65

| BMP AREA 2 | | |
|---|---|---|
| TOTAL DRAINAGE AREA : | AREA (SQ FT) | AREA (AC) |
| | 226,512 | 5.20 |

I. SELF-TREATING AREAS

SELF-TREATING VEGETATED/LANDSCAPED AREAS

| DMA NAME | SURFACE TYPE | DMA AREA (SQ FT) | DMA AREA (AC) | DMA RUNOFF FACTOR | 85TH PERCENTILE PRECIPITATION DEPTH (IN) | 85TH PERCENTILE VOLUME (CU FT) |
|---|---|---|---|---|---|---|
| 1 | VEGETATED | 203,713 | 4.68 | 0.1 | 0.65 | 1103 |

II. AREAS DRAINING TO IMPs

ROOFS, SIDEWALKS, AND STREETS DRAINING TO IMPS (BASIN)

| DMA NAME | SURFACE TYPE | DMA AREA (SQ FT) | DMA AREA (AC) | DMA RUNOFF FACTOR | 85TH PERCENTILE PRECIPITATION DEPTH (IN) | 85TH PERCENTILE VOLUME (CU FT) |
|---|---|---|---|---|---|---|
| 2 | PAVED | 22,799 | 0.52 | 1 | 0.65 | 1235 |

IMP SIZING FOR BIORETENTION BASIN #2

BIORETENTION BASIN AREA-VOLUME CALCS

| ELEV (FT) | SURFACE AREA (SQ FT) | TOTAL VOLUME (CU FT) |
|---|---|---|
| 0 | 6,354 | 0.0 |
| 0.5 | 7,187 | 3385.0 |
| 3 | 11,656 | 26,939.0 |

| | |
|---|---|
| TOTAL 85TH PERCENTILE RUNOFF VOLUME (CU FT) | 2,338 |
| PROPOSED BASIN VOLUME (CU FT) | 26,939.00 |
| MAX 85TH PERCENTILE PONDING DEPTH (FT) | 0.5 |

| **Bioretention Area Design Calculations** | | |
|---|---|---|
| Minimum required filter bed depth (Df): | 2.0 | ft |
| Filter media infiltration rate (K)*: | 1.0 | in/hr |
| Surface ponding depth (Dp): | 6.0 | in |
| Design drain time (t): | 48.0 | hr |
| **Required Filter Bed Surface Area (SA):** | **935** | **sq ft** |
| **Proposed Bioretention Bottom Surface Area:** | **6,354** | **sq ft** |

PROJECT NAME: SANTA FE HEIGHTS
PROJECT LOCATION: SAN DIEGO COUNTY
85TH PERCENTILE PRECIPITATION DEPTH (IN): 0.65

| BMP AREA 3 | | |
|---|---|---|
| TOTAL DRAINAGE AREA : | AREA (SQ FT) | AREA (AC) |
| | 217,800 | 5.00 |

I. SELF-TREATING AREAS

SELF-TREATING VEGETATED/LANDSCAPED AREAS

| DMA NAME | SURFACE TYPE | DMA AREA (SQ FT) | DMA AREA (AC) | DMA RUNOFF FACTOR | 85TH PERCENTILE PRECIPITATION DEPTH (IN) | 85TH PERCENTILE VOLUME (CU FT) |
|---|---|---|---|---|---|---|
| 1 | VEGETATED | 200,119 | 4.59 | 0.1 | 0.65 | 1084 |

II. AREAS DRAINING TO IMPs

ROOFS, SIDEWALKS, AND STREETS DRAINING TO IMPS (BASIN)

| DMA NAME | SURFACE TYPE | DMA AREA (SQ FT) | DMA AREA (AC) | DMA RUNOFF FACTOR | 85TH PERCENTILE PRECIPITATION DEPTH (IN) | 85TH PERCENTILE VOLUME (CU FT) |
|---|---|---|---|---|---|---|
| 2 | PAVED | 17,681 | 0.41 | 1 | 0.65 | 958 |

IMP SIZING FOR BIORETENTION BASIN #3

BIORETENTION BASIN AREA-VOLUME CALCS

| ELEV (FT) | SURFACE AREA (SQ FT) | TOTAL VOLUME (CU FT) |
|---|---|---|
| 0 | 4,050 | 0.0 |
| 0.5 | 4,489 | 2135.0 |
| 4 | 7,744 | 23,588.0 |

| | |
|---|---|
| TOTAL 85TH PERCENTILE RUNOFF VOLUME (CU FT) | 2,042 |
| PROPOSED BASIN VOLUME (CU FT) | 23,588 |
| MAX 85TH PERCENTILE PONDING DEPTH (FT) | 0.5 |

| **Bioretention Area Design Calculations** | | |
|---|---|---|
| Minimum required filter bed depth (Df): | 2.0 | ft |
| Filter media infiltration rate (K)*: | 1.0 | in/hr |
| Surface ponding depth (Dp): | 6.0 | in |
| Design drain time (t): | 48.0 | hr |
| **Required Filter Bed Surface Area (SA):** | **817** | **sq ft** |
| **Proposed Bioretention Bottom Surface Area:** | **4,050** | **sq ft** |

PROJECT NAME: SANTA FE HEIGHTS
PROJECT LOCATION: SAN DIEGO COUNTY
85TH PERCENTILE PRECIPITATION DEPTH (IN): 0.65

| BMP AREA 4 | | |
|---|---|---|
| TOTAL DRAINAGE AREA : | AREA (SQ FT) | AREA (AC) |
| | 283,140 | 6.50 |

I. SELF-TREATING AREAS

SELF-TREATING VEGETATED/LANDSCAPED AREAS

| DMA NAME | SURFACE TYPE | DMA AREA (SQ FT) | DMA AREA (AC) | DMA RUNOFF FACTOR | 85TH PERCENTILE PRECIPITATION DEPTH (IN) | 85TH PERCENTILE VOLUME (CU FT) |
|---|---|---|---|---|---|---|
| 1 | VEGETATED | 256,328 | 5.88 | 0.1 | 0.65 | 1388 |

II. AREAS DRAINING TO IMPs

ROOFS, SIDEWALKS, AND STREETS DRAINING TO IMPS (BASIN)

| DMA NAME | SURFACE TYPE | DMA AREA (SQ FT) | DMA AREA (AC) | DMA RUNOFF FACTOR | 85TH PERCENTILE PRECIPITATION DEPTH (IN) | 85TH PERCENTILE VOLUME (CU FT) |
|---|---|---|---|---|---|---|
| 2 | PAVED | 26,812 | 0.62 | 1 | 0.65 | 1452 |

IMP SIZING FOR BIORETENTION BASIN #5

BIORETENTION BASIN AREA-VOLUME CALCS

| ELEV (FT) | SURFACE AREA (SQ FT) | TOTAL VOLUME (CU FT) |
|---|---|---|
| 0 | 6,567 | 0.0 |
| 0.5 | 7,584 | 3538.0 |
| 4 | 14,318 | 41,866.0 |

| | |
|---|---|
| TOTAL 85TH PERCENTILE RUNOFF VOLUME (CU FT) | 2,841 |
| PROPOSED BASIN VOLUME (CU FT) | 41,866 |
| MAX 85TH PERCENTILE PONDING DEPTH (FT) | 0.5 |

| **Bioretention Area Design Calculations** | | |
|---|---|---|
| Minimum required filter bed depth (Df): | 2.0 | ft |
| Filter media infiltration rate (K)*: | 1.0 | in/hr |
| Surface ponding depth (Dp): | 6.0 | in |
| Design drain time (t): | 48.0 | hr |
| **Required Filter Bed Surface Area (SA):** | **1136** | **sq ft** |
| **Proposed Bioretention Bottom Surface Area:** | **6,567** | **sq ft** |


117° 9' 42"
117° 9' 29"
484900
484950
485000
485050
485100
485150
485200
33° 1' 19"
33° 1' 4"
3653750
3653700
3653650
3653600
3653550
3653500
3653450
3653400
3653350
3653300
Top O the Morning Way
HrE2
HrC
Artesian Rd
Map Scale: 1:2,260 if printed on A size (8.5" x 11") sheet.
N
Meters
0 20 40 80 120
Feet
0 50 100 200 300

## MAP LEGEND

**Area of Interest (AOI)**

- Area of Interest (AOI)

**Soils**

- Soil Map Units

**Soil Ratings**

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Political Features**

- Cities

**Water Features**

- Oceans
- Streams and Canals

**Transportation**

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

## MAP INFORMATION

Map Scale: 1:2,260 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 6, Dec 17, 2007

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Hydrologic Soil Group

| Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California | | | | |
|---|---|---|---|---|
| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
| HrC | Huerhuero loam, 2 to 9 percent slopes | D | 19.6 | 95.7% |
| HrE2 | Huerhuero loam, 15 to 30 percent slopes, eroded | D | 0.9 | 4.3% |
| **Totals for Area of Interest** | | | **20.5** | **100.0%** |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* *None Specified*

*Tie-break Rule:* Lower


117° 9' 42"
117° 9' 29"
484900
484950
485000
485050
485100
485150
485200
33° 1' 19"
33° 1' 4"
3653750
3653700
3653650
3653600
3653550
3653500
3653450
3653400
3653350
3653300
Top O the Morning Way
HrE2
HrC
Artesian Rd
Map Scale: 1:2,260 if printed on A size (8.5" x 11") sheet.
N
Meters
0 20 40 80 120
Feet
0 50 100 200 300

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**
- Soil Map Units

**Soil Ratings**
- .02
- .05
- .10
- .15
- .17
- .20
- .24
- .28
- .32
- .37
- .43
- .49
- .55
- .64
- Not rated or not available

**Political Features**
- Cities

**Water Features**
- Oceans
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

## MAP INFORMATION

Map Scale: 1:2,260 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 6, Dec 17, 2007

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# K Factor, Rock Free

| K Factor, Rock Free— Summary by Map Unit — San Diego County Area, California | | | | |
|---|---|---|---|---|
| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
| HrC | Huerhuero loam, 2 to 9 percent slopes | .37 | 19.6 | 95.7% |
| HrE2 | Huerhuero loam, 15 to 30 percent slopes, eroded | .37 | 0.9 | 4.3% |
| **Totals for Area of Interest** | | | **20.5** | **100.0%** |

## Description

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kf (rock free)" indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

## Rating Options

*Aggregation Method:* Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

*Component Percent Cutoff: None Specified*

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

*Tie-break Rule:* Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

*Layer Options:* Surface Layer

For an attribute of a soil horizon, a depth qualification must be specified. In most cases it is probably most appropriate to specify a fixed depth range, either in centimeters or inches. The Bottom Depth must be greater than the Top Depth, and the Top Depth can be greater than zero. The choice of "inches" or "centimeters" only applies to the depth of soil to be evaluated. It has no influence on the units of measure the data are presented in.

When "Surface Layer" is specified as the depth qualifier, only the surface layer or horizon is considered when deriving a value for a component, but keep in mind that the thickness of the surface layer varies from component to component.

When "All Layers" is specified as the depth qualifier, all layers recorded for a component are considered when deriving the value for that component.

Whenever more than one layer or horizon is considered when deriving a value for a component, and the attribute being aggregated is a numeric attribute, a weighted average value is returned, where the weighting factor is the layer or horizon thickness.

# ATTACHMENT E

## Geotechnical Certification Sheet

**(Not Applicable – Infiltration BMPs are not proposed for this project)**

# ATTACHMENT F

## Maintenance Plan

### Maintenance Requirements

Per the *County of San Diego Standard Urban Storm Water Mitigation Manual* (January 2011), private project applicants must propose an agreement which assures the County that all permanent BMPs will be maintained throughout the life of the project. Although no maintenance agreement has been made for this stage of the project, the site will be operated and maintained by Starwood Santa Fe Valley Partners until a formal agreement has been made and an HOA has been established. Revisions to this WQTR will update this section as necessary. Once the HOA has been established, they will be responsible for maintaining site BMPs. A maintenance plan will be developed during final engineering and will include the following information:

- Specification of routine and non-routine maintenance activities to be performed
- A schedule for maintenance activities
- Name, qualifications, and contact information for the parties responsible for maintaining the BMPs

For proper maintenance to be performed, the storm water treatment facilities must be accessible to both maintenance personnel and their equipment and materials.

### Operations and Maintenance Plan

**Maintenance Program for Vegetated Swales**

| **Inspection Frequency/Indications:** | Regular Inspections<br>❑ Before wet season begins (September);<br>❑ After wet season (April).<br>Performance Inspections<br>❑ After rainfall events greater than 0.5 inch |
|---|---|
| **Maintenance Indications** | **Maintenance Activities** |
| ❑ Damage to slopes, inlet, outlet, or other structures | ❑ Repair slopes, inlet, outlet, or other structures |
| ❑ Barren areas or badly established vegetation | ❑ Re-plant or re-seed barren areas or badly established vegetation, use erosion control mats if necessary |
| ❑ Over-grown vegetation, emergent woody vegetation and/or weeds | ❑ Trim vegetation to 6 inches, remove emergent woody vegetation and weeds |
| ❑ Sediment accumulation over 3 inches | ❑ Remove sediment accumulation |
| ❑ Trash and litter present in swale | ❑ Remove trash and debris |
| ❑ Rodent burrows that inhibit function of facility | ❑ Abate rodents and other vectors as necessary |
| ❑ Standing water in facility | ❑ Drain standing water |
| **Waste Disposal** | Sediment, other pollutants, and all other waste shall be properly disposed of in a licensed landfill or by another appropriate disposal method in accordance with local, state, and federal regulations. |

**Maintenance Program for Water Quality Basins**

| **Inspection Frequency/Indications:** | Regular Inspections<br>❑ Before wet season begins (September);<br>❑ Every 60 days during wet season (September-April);<br>❑ After wet season (April).<br>Performance Inspections<br>❑ After rainfall events greater than 0.5 inch |
|---|---|
| **Maintenance Indications Connections** | **Maintenance Activities Connections** |
| ❑ Damage to inlet/outlet, sideslopes, headwall, or other structures | ❑ Repair inlet/outlet structures, side slopes, fences, or other structural elements as needed to maintain performance of the facility. |
| ❑ Over-grown vegetation, emergent woody vegetation and/or weeds | ❑ Trim vegetation to average height of 12 inches and remove trimmings.<br>❑ Remove emergent trees and other vegetation that are not part of bioretention basin plan and weeds<br>❑ Re-seed and re-plan barren areas prior to rainy season<br>❑ Install erosion blanket on barren spots if re-vegetation is not successful |
| ❑ Sediment accumulation over 3 inches | ❑ Remove sediment accumulation at or near plant height |
| ❑ Trash, debris, and vegetative litter | ❑ Remove trash, debris, and vegetative litter |
| ❑ Rodents or other vectors | ❑ Abate and control rodents as necessary to maintain performance of the facility<br>❑ Drain standing water |
| **Waste Disposal** | Sediment, other pollutants, and all other waste shall be properly disposed of in a licensed landfill or by another appropriate disposal method in accordance with local, state, and federal regulations. |

## Maintenance Funding

Funding for all water quality treatment areas will be provided by Starwood Santa Fe Valley Partners for the Santa Fe Heights development until a formal agreement has been developed by Starwood Santa Fe Valley Partners and approved by the County of San Diego. The agreement will establish a Homeowners Association which will be responsible to perform the maintenance activities and to ensure adequate funding into perpetuity.

The County of San Diego Storm Water Standards requires maintenance of BMPs in perpetuity to ensure the proper function and operation of theses BMPs. Costs for this maintenance will be the responsibility of Starwood Santa Fe Valley Partners at the time of inception and by the HOA once the association is established.

Please contact Starwood Santa Fe Valley Partners (Noel Humphrey) with any project-specific funding inquiries.

Starwood Santa Fe Valley Partners
P.O. Box 2504
Rancho Santa Fe, CA 92067
Telephone: (858) 756-6300

# ATTACHMENT G

## Treatment Control BMP Certification for DPW Permitted Land Development Projects

# County of San Diego

## DEPARTMENT OF PUBLIC WORKS

### Treatment Control BMP Certification for DPW Permitted Land Development Projects

Permit Number _____ SWMP # _____

Project Name _____

Location / Address _____

**Responsible Party for Construction Phase**

Developer's Name: _____

Address: _____

City _____ State _____ Zip _____

Email Address: _____

Phone Number: _____

Engineer of Work: _____

Engineer's Phone Number: _____

**Responsible Party for Perpetual Maintenance**

Owner's Name(s)*_____

Address: _____

City _____ State _____ Zip _____

Email Address: _____

Phone Number: _____

*Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information of president at time of project closeout.

Maintenance Agreement No.: _____

Percent Impervious Before Construction: %_____
Percent Impervious After Construction: _____

Proposed Disturbed Area: _____Acres

Hydromodification Management:
Yes ☐ or No ☐

**Primary or Secondary Pollutants of Concerns** (*check all that apply*)

- ☐ Sediment
- ☐ Nutrients
- ☐ Organic Compounds
- ☐ Trash and Debris
- ☐ Oxygen Demanding Substances
- ☐ Oil and Grease
- ☐ Bacteria and Viruses
- ☐ Pesticides

**Site Layout Strategies** (*check all that apply*)

- ☐ Conserve Natural Areas
- ☐ Minimize Disturbance to Natural Areas
- ☐ Minimize and Disconnect Imp.Surfaces
- ☐ Minimize Soil Compaction
- ☐ Minimize erosion from slopes

**Disperse Runoff from Impervious Surfaces to Pervious** (*check all that apply*)

- ☐ Use of pervious surfaces
- ☐ Street and Road Design
- ☐ Parking Lot Design
- ☐ Driveway, Sidewalk, Bikepath Design
- ☐ Building Design
- ☐ Landscape Design

**Source BMPs** (*check all that apply*)

- ☐ Storm Drain Inlets
- ☐ Interior Floor Drains
- ☐ Interior Parking Garages
- ☐ Indoor & Structural Pest Control
- ☐ Landscape/Outdoor Pesticide Use
- ☐ Pools, spas, etc.
- ☐ Food Service
- ☐ Refuse Areas
- ☐ Industrial Processes
- ☐ Outdoor Storage of Equipment and Materials
- ☐ Vehicle and Equipment Cleaning
- ☐ Vehicle/ Equipment Repair and Maintenance
- ☐ Fuel Dispensing Areas
- ☐ Loading Docks
- ☐ Fire Sprinkler Test Water
- ☐ Misc. drain or wash water
- ☐ Plazas, sidewalks, and parking lots

**Treatment Control, Hydromodification and LID BMPs**

| BMP Identifier; (Identifier to match TCBMPs on TCBMP Table.) | Type | Record Plan Page for TCMBP | BMP Pollutant of Concern Efficiency (H,M,L) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

(Add sheet for all additional BMPs)

The Maintenance Agreement has been recorded. Yes ☐ or No ☐

Please sign your name and seal. [SEAL]

Engineer's Print Name: _____

Engineer's Signed Name: _____

Date: _____

**Submittals Required with Certification:**

- Copy of the final approved SWMP.
- Copy of the approved record plan showing Stormwater TCBMP Table and the location of each verified as-built TCBMP.
- Copy of the specification sheets for the verified proprietary TCBMPs
- Recorded Maintenance Agreement (Category 1 or 2 only)
- Photograph(s) of TCBMP(s)

**COUNTY – OFFICIAL USE ONLY:**

For PDCI:
PDCI Inspector:_____

Date Project has/expects to close:_____

Date Certification received from EOW:_____

DPW Inspector concurs that every noted BMP on the plan and the SWMP or SWMP Addendum is installed onsite through field verification and completed as certified: Yes ☐
or No ☐

PDCI Inspector's Signed Name:_____ Date:_____

FOR WPP:
Date Received from PDCI:_____

WPP Submittal Reviewer:_____

WPP Reviewer concurs that the provided TC-BMP information is acceptable to enter into the TC-BMP Maintenance verification inventory. Yes or No

WPP Reviewer's Signed Name: _____Date:_____

# ATTACHMENT H

## HMP Exemption Documentation
## (if applicable)

# ATTACHMENT I

## Addendum:

## 1. Hydromodification Management Plan

# Hydromodification Management Plan

## 1 – Introduction

According to the 2011 Final Hydromodification Plan (HMP), all priority projects that have the potential to increase unmitigated peak flows, and that do not directly discharge to exempt water bodies are required to perform a hydromodification analysis. This project is therefore required to manage hydromodification impacts.

The proposed site is located north of Artesian Road, south of Top Of The Morning Way and west of Caminito Del Vientecito within the County of San Diego, California (See Figure 1).

The proposed development includes grading eight single family pads with a private road, gravel maintenance access road, and an internal storm drainage system.

The existing land use consists of undeveloped naturally vegetated open space. The project contains type “D” soils. Therefore, infiltration is not recommended for this site.

In the existing condition, the project contains a high point located in the center of the property. Runoff drains toward all four corners of the project to the north, south, east, and west. Slopes range from 5% to 10%.

In the existing condition the northeastern portion of the site drains toward the northeast corner of the site and discharges into an existing drainage ditch. This location is designated as Point of Compliance (POC) 1. The southeastern portion of the site drains toward the southeastern corner of the property, and onto Artesian Road. This location is designated as POC 2. The northwestern portion of the site drains toward the northwestern corner of the property, and onto Top of the Morning Way. This location is designated as POC 3. The southwestern portion of the site drains toward the southwestern corner of the property, and onto Artesian Road. This location is designated as POC 4.

Runoff from the northern portion of the property eventually enters the San Dieguito River approximately 0.5 miles to the northwest, while runoff from the remaining portions of the property will enter Lusardi Creek approximately 1 mile to the southwest, then the San Dieguito River.

The Escondido precipitation file was used for this project, which includes forty years of precipitation data.

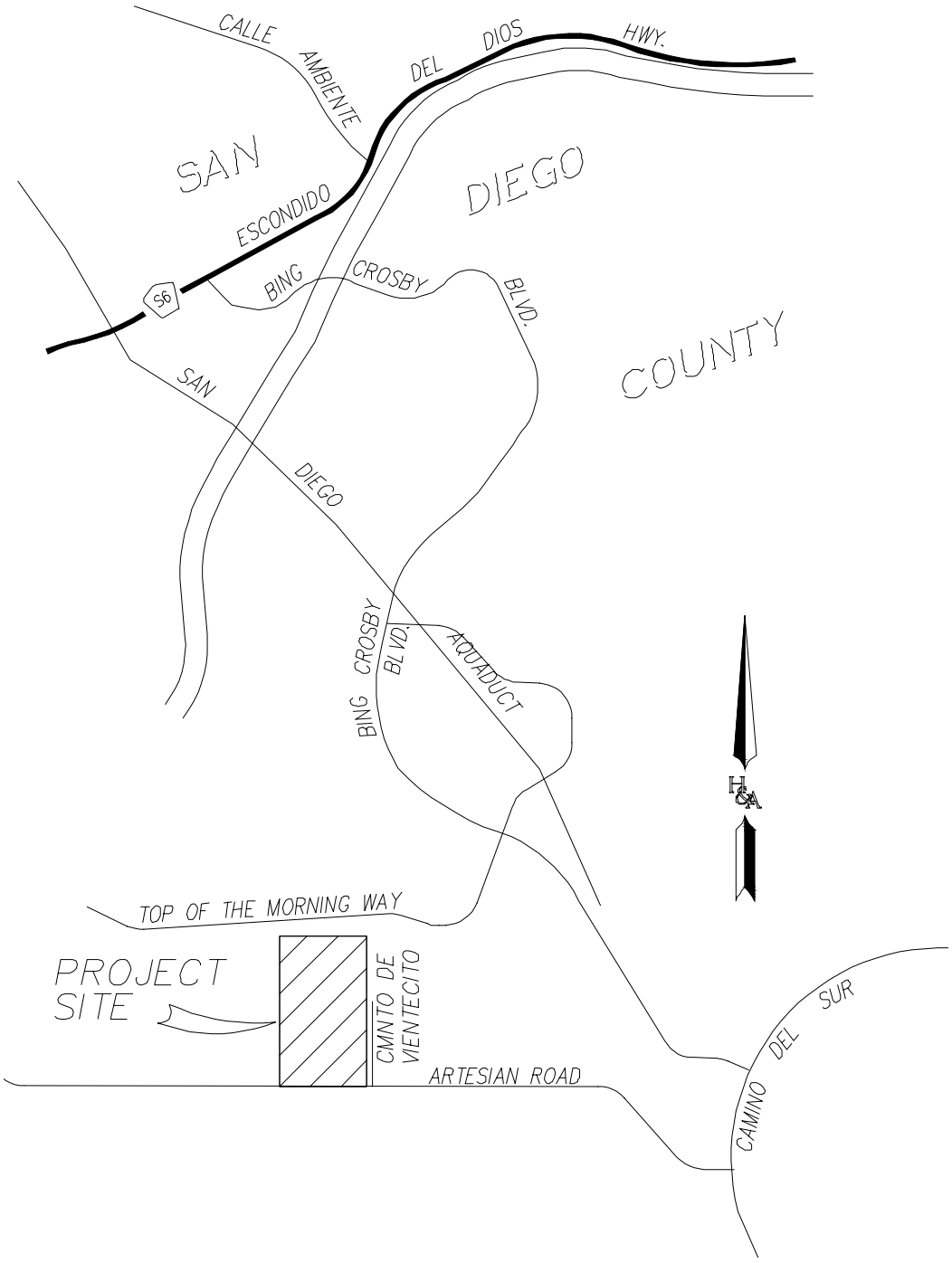



**Figure 1 Vicinity Map**

## 2 – Methodology

Since house layouts have not been determined at this preliminary stage of the project, 5,000 square feet of impervious area was assumed for each lot. This includes the roof area, potential patios, sidewalks, driveways, and decks. The actual area of the proposed street (Calle Montana) was included in the impervious area calculations. This value will be finalized during final engineering when the design for each home is determined.

The San Diego Hydrology Model (SDHM) Version 2011/2/15 was used to generate a continuous simulation hydrologic model over the project site during the existing and proposed conditions. The analysis incorporated the following criteria, as required by the March 2011 Final Hydromodification Management Plan (HMP):

- Use of a lower threshold of 10% of Q2 (0.1Q2), and an upper threshold of Q10.
- Use of partial-duration series frequency calculations to more accurately estimate flow frequency response.
- Assess the SDHM model so that post-project discharge rates and durations do not deviate above the pre-project discharge rates and durations by more than 10 percent or over more than 10 percent of the length of the flow duration curve.

To generate a continuous simulation model, peak flow frequency, and duration statistics were developed using SDHM. The default method within SDHM determines the flow thresholds by calculating a partial duration series. An alternative method is to us an “annual peak” method, which considers just one annual peak storm event in order to calculate the rainfall recurrence interval. Because of San Diego’s semi-arid climate, in which long periods of time can elapse between significant rainfall events, the use of this peak annual series tends to unrealistically underestimate flow return event values, especially for the 2-year storm. The partial-duration series method is a more applicable rainfall series for the semi-arid climate in San Diego County.

The partial duration series events have been separated into discrete rainfall events assuming the following criteria:

- For the discrete rainfall events, a lower flow limit was set to a very small value, equal to 0.002 cfs per acres of contributing drainage area.
- A new discrete event is designated when the flow falls below 0.002 cfs per acre for a time period of 24 hours.

This method was used within the model and resulted with threshold values of 0.1*Q2 to Q10 for each point of compliance.

Partial duration calculations were double-checked by hand when SDHM “Durations” results gave 0.1*Q2 and Q10 threshold values that seemed to be too low or too high. This was achieved by using the following procedures within Microsoft Excel:

1. Export the pre-developed flow rates from the drainage area in question using the Tools → Export Dataset option within SDHM.
2. Open the exported dataset in Excel and select all individual hourly flowrates that are 0.002 cfs/acre or greater.
3. Organize the selected flowrates into separate storms based on the time lapse between each period of precipitation (24 hour minimum).
4. Verify the peak flowrate for each individual storm event.

5. Based on these peak flowrates and the number of years of precipitation, calculate the flowrate for the 2-year (Q2) and 10-year (Q10) storms. This was done by determining the position of the 2-year or 10-year storm within the hydrograph that was produced using the peak flowrates and selecting the flowrate at that position.
6. The partial duration thresholds were then determined by using Q10 and calculating 0.1*Q2.

If there were discrepancies between the hand calculated partial duration calculations and the thresholds produced by SDHM, the hand calculated thresholds were used. These values were input into SDHM through the View → Options → Duration Criteria tab, and were entered as user defined flow values for the specified point of compliance.

Peak flow frequency and flow duration curves were then generated using the thresholds within SDHM for pre-project and post-project conditions. Both pre-project and post-project simulation runs extended for the entire length of the rainfall record. To determine if the runoff at a point of compliance met hydromodification requirements, several iterations were run while design criteria for the proposed mitigation area was adjusted until the post-project flow duration statistics did not exceed those during pre-development conditions by more than 10 percent or occurred more than 10 percent of the time.

## 3– Results

Four POCs were analyzed for hydromodification impacts.

Table 2 below summarizes the drainage areas to each point of compliance as well as the upper and lower thresholds from the internal partial duration series method results. The lower thresholds for POCs 3 and 4 that were produced by the SDHM program seemed unrealistically low. The 0.1Q2 and Q10 thresholds for POC 3 were 0.02 cfs and 1.83 cfs, while the thresholds for POC 4 were 0.04 cfs to 3.11 cfs. Therefore, partial duration hand calculations were performed for these two areas to double-check these threshold values. The partial duration hand calculations resulted with higher values than those produced by SDHM (See Table 2). These hand calculation values where therefore used for this study for these two POCs instead of the SDHM values. Refer to Appendix 2 for the partial duration hand calculations. The lower thresholds for POC 1 and POC 2 also seem low; however, since both areas passed the SDHM duration requirements with these low thresholds, they were left with the default values.

**TABLE 2 - Summary of Areas and Flow Thresholds**

| | Drainage Area (ac) | | | | Flow Thresholds (cfs)* | |
|---|---|---|---|---|---|---|
| | Existing Condition | | Proposed Condition | | | |
| | Impervious area (ac) | Pervious Area (ac) | Impervious area (ac) | Pervious Area (ac) | 0.1Q2 | Q10 |
| **POC 1** | 0.0 | 3.1 | 0.1 | 2.8 | 0.03 | 1.42 |
| **POC 2** | 0.0 | 5.7 | 0.6 | 4.6 | 0.035 | 2.61 |
| **POC 3** | 0.0 | 4.0 | 0.4 | 4.6 | 0.09 | 1.85 |
| **POC 4** | 0.0 | 6.8 | 0.6 | 5.9 | 0.15 | 3.14 |

* Flow thresholds for POCs 3 and 5 were calculated by hand and include calculations in Appendix 2. The remaining thresholds were calculated by the SDHM program.

Mitigation was not necessary for the area draining to POC 1 due to the decrease in drainage area.

Basins were used as mitigation measures for POCs 2, 3, and 4. Each basin will include a perforated sub-drain and engineered fill, which will be designed in more detail during final engineering.

Due to the soil type “D” for this project, infiltration basins are not proposed. The final design criteria for each basin that was used in SDHM are listed in Table 3. These results can be found in Appendix 3 as part of the SDHM input criteria. SDHM modeling results can also be found in Appendix 3.

## TABLE 3 – Design Criteria for Proposed Mitigation Areas

| | POC 1 | POC 2 | POC 3 | POC 4 |
|---|---|---|---|---|
| **Bottom Length (ft)** | -- | 200 | 90 | 300 |
| **Bottom Width (ft)** | -- | 31.77 | 45 | 21.89 |
| **Total Depth (ft)** | -- | 3 | 5 | 4 |
| **Side Slopes** | -- | 3:1 | 3:1 | 3:1 |
| **Riser Diameter (in)** | -- | 6 | 4 | 6 |
| **Riser Height (ft)** | -- | 2.5 | 4.5 | 3.5 |
| **Orifice Diameter (in)** | -- | 0.5 | 1 | 1 |
| **Orifice Height (ft)** | -- | 0 | 0 | 0 |

Drawdown calculations provided in Appendix 4, indicate that a vector control plan must be implemented. This is due to drawdown times for each pond exceeding the 96 hour limit. Alternative design features, such as larger outlet facilities, could mitigate this issue; however, larger orifice sizes would not meet HMP requirements. The previously mentioned vector control plan will be submitted for approval during final engineering.

# Appendix 1 – Hydromodification Exhibits

MAP NO.
14557

APN
267-210-39

APN
267-210-40

APN
267-210-42

APN
267-147-02

APN
267-147-01

APN
267-145-18

APN
267-145-17

APN
267-145-15

EXISTING TYPE D-75 DRAINAGE DITCH

EXISTING TYPE D-75 CONC. BROW DITCH

1

2

3

4

3.1 ACRES

5.7 ACRES

4.0 ACRES

6.8 ACRES

START OF EXISTING BLOCK WALL

END OF EXISTING BLOCK WALL

## LEGEND

DRAINAGE BOUNDARY

FLOWLINE

POINT OF COMPLIANCE (1)

DRAINAGE AREA 1.00 ACRES

PERVIOUS AREA

50 0 50 100 150

SCALE 1"=50'

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 5707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

EXISTING CONDITION HYDROMODIFICATION EXHIBIT FOR

# SANTA FE HEIGHTS

COUNTY OF SAN DIEGO, CALIFORNIA

SHEET 1 OF 2

W.O.#

R:\0905\&Hyd\ACAD\0905-HYDROMOD-EX.dwg[]Oct-03-2011:14:44

50 0 50 100 150
SCALE 1"=50'

1
2
3
4

PROPOSED 20' TRAIL EASEMENT-SEE SHEET 3 FOR EASEMENT LOCATION

EXISTING TYPE D-75 DRAINAGE DITCH

EXISTING 24" R.C.P. DRAIN PER COUNTY DWG. NO. T.P.M. 19(

EXISTING 18" C.M.P. DRAIN PER COUNTY DWG. NO. T.P.M. 19(

2.9 ACRES

5.2 ACRES

5.0 ACRES

6.5 ACRES

BASIN 2

BASIN 3

BASIN 4

LOT IMPERVIOUS = 2,500 SQ FT

LOT IMPERVIOUS = 5,000 SQ FT

ROAD IMPERVIOUS = 12,800 SQ FT

ROAD IMPERVIOUS = 12,000 SQ FT

ROAD IMPERVIOUS = 7,700 SQ FT

START OF EXISTING BLOCK WALL

PROPOSED PATHWAY & PATHWAY EASEMENT ALIGNED TO AVOID CONFLICT WITH EXISTING UTILITIES DESCRIBED BELOW

END OF EXISTING BLOCK WALL

MAP NO. 14557

APN 267-210-39

APN 267-210-40

APN 267-210-42

APN 267-147-01

APN 267-147-02

APN 267-145-17

APN 267-145-18

APN 267-145-15

## LEGEND

DRAINAGE BOUNDARY

FLOWLINE

POINT OF COMPLIANCE (1)

TOTAL DRAINAGE AREA 1.00 ACRES

IMPERVIOUS AREA*

PERVIOUS AREA

* HOUSE LOTS ARE NOT YET SHOWN. HOWEVER, 5,000 SQ FT OF IMPERVIOUS AREA WAS ASSUMED FOR EACH LOT IN THE DESIGN CALCULATIONS.

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 - FX(858)558-1414

PROPOSED CONDITION HYDROMODIFICATION EXHIBIT FOR

# SANTA FE HEIGHTS

COUNTY OF SAN DIEGO, CALIFORNIA

SHEET 2 OF 2

W.O.#

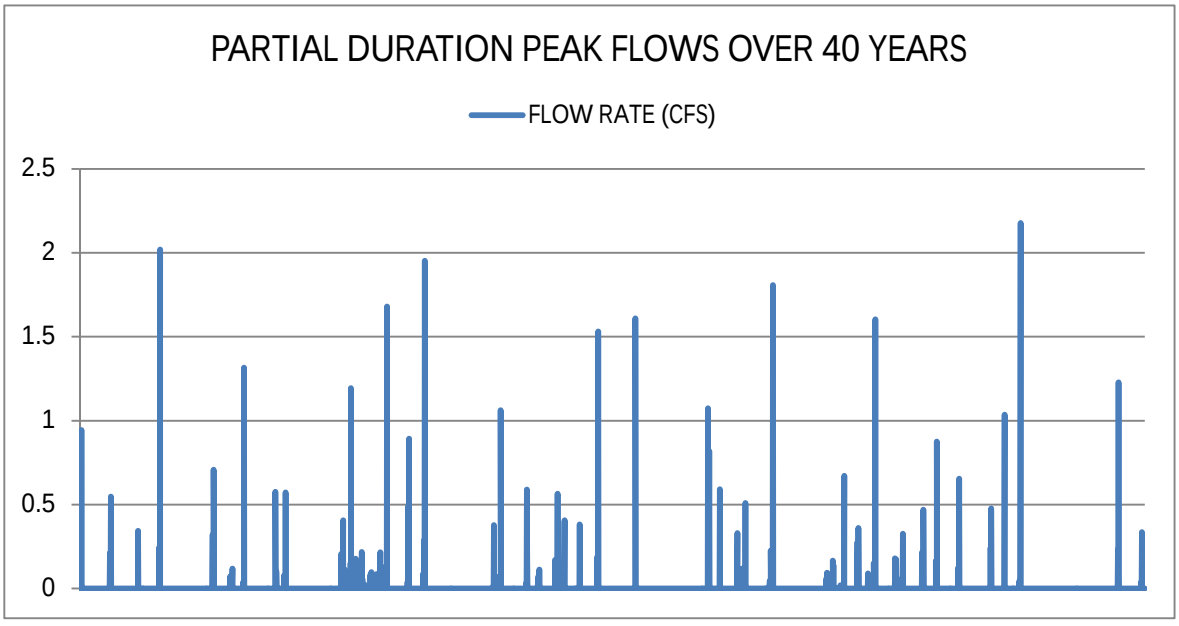
R:\0905\&Hyd\ACAD\0905-HYDROMOD-PR.dwg[]Oct-03-2011 12:17

## Appendix 2 – Partial Duration Calculations

SANTA FE HEIGHTS
PARTIAL DURATION SERIES CALCULATIONS

| POC 3 | | |
|---|---|---|
| EXISTING CONDITION | | |
| Contributing Area: | 4.0 | acres |
| Threshold: | 0.002 | cfs/acre |
| # years: | 40 | yrs |
| # storms: | 267 | storms |

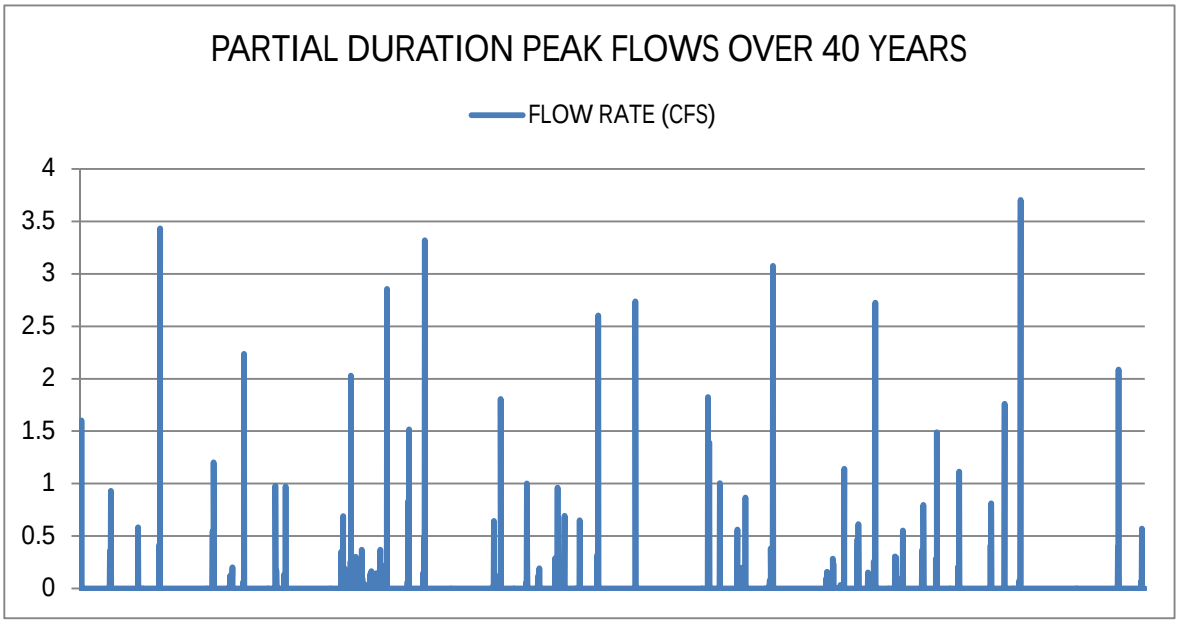
| STORM EVENT | Position | Q (cfs) | 0.1*Q2 (cfs) |
|---|---|---|---|
| Q2 | 20.00 | 0.88 | 0.09 |
| Q3 | 13.33 | 1.16 | |
| Q4 | 10.00 | 1.53 | |
| Q5 | 8.00 | 1.61 | |
| Q6 | 6.67 | 1.66 | |
| Q7 | 5.71 | 1.72 | |
| Q8 | 5.00 | 1.81 | |
| Q9 | 4.44 | 1.83 | |
| Q10 | 4.00 | 1.85 | |
| Q25 | 1.60 | 2.08 | |



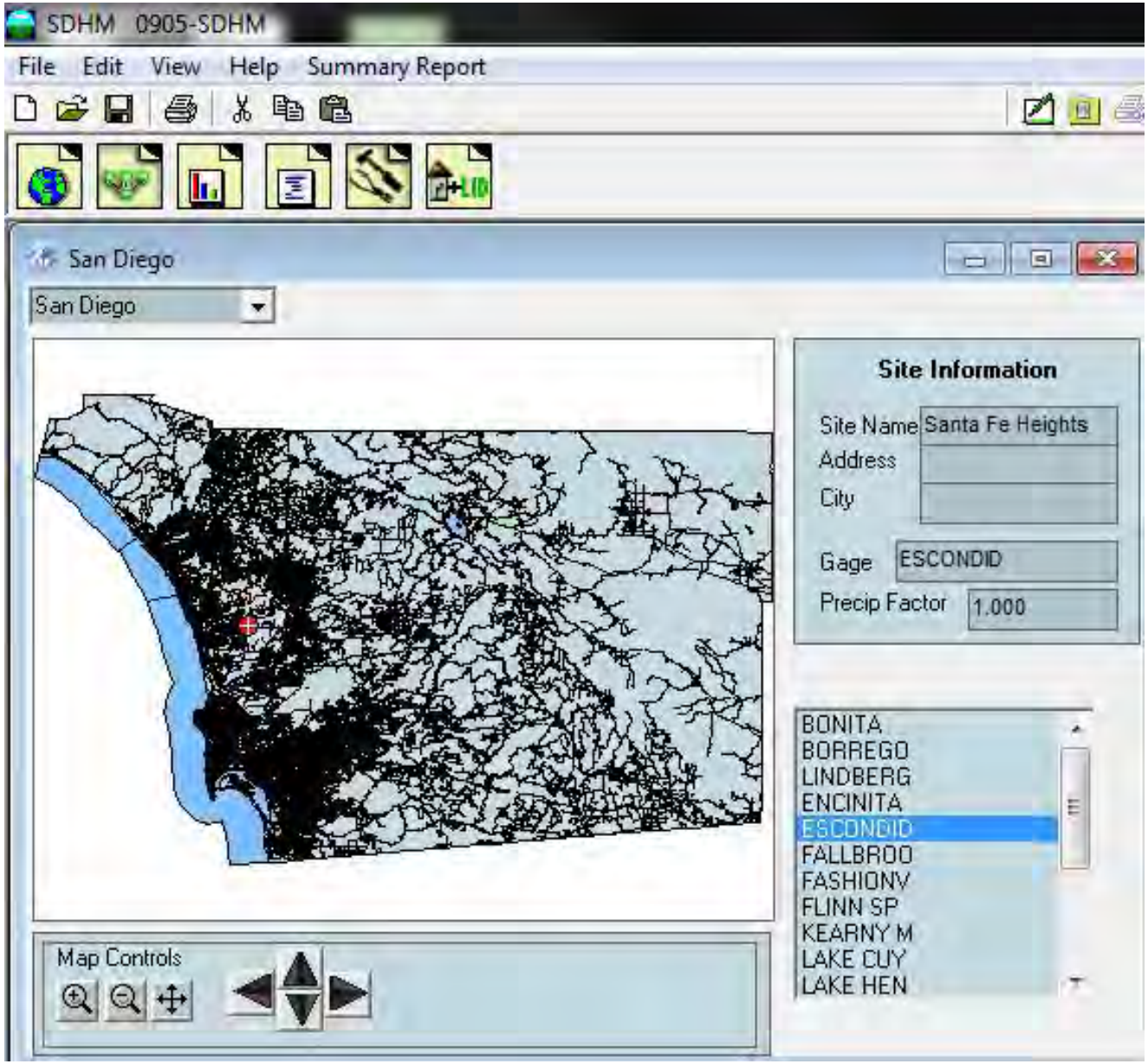
SANTA FE HEIGHTS
PARTIAL DURATION SERIES CALCULATIONS

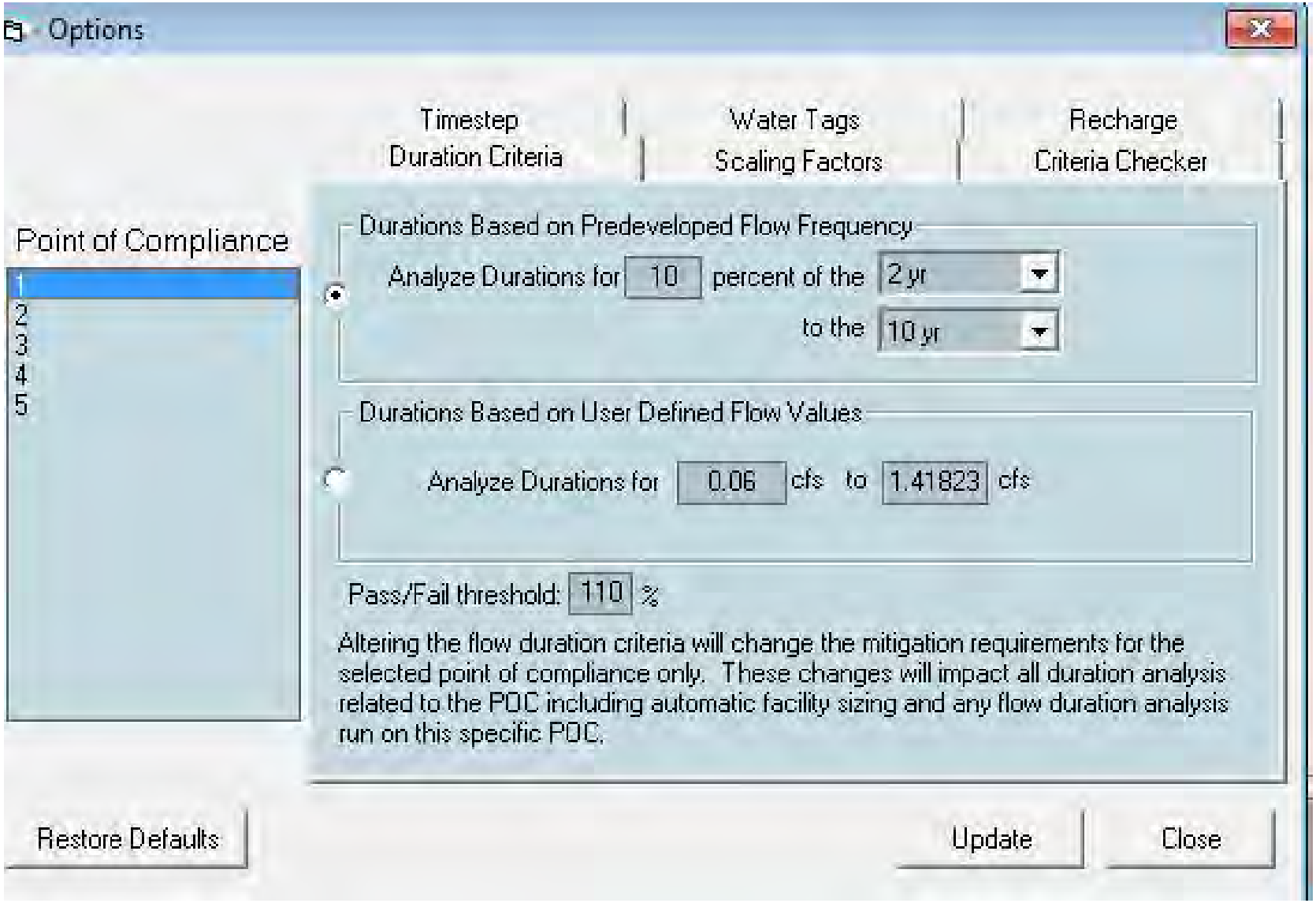
| POC 4 | | |
|---|---|---|
| EXISTING CONDITION | | |
| Contributing Area: | 6.8 | acres |
| Threshold: | 0.002 | cfs/acre |
| # years: | 40 | yrs |
| # storms: | 267 | storms |

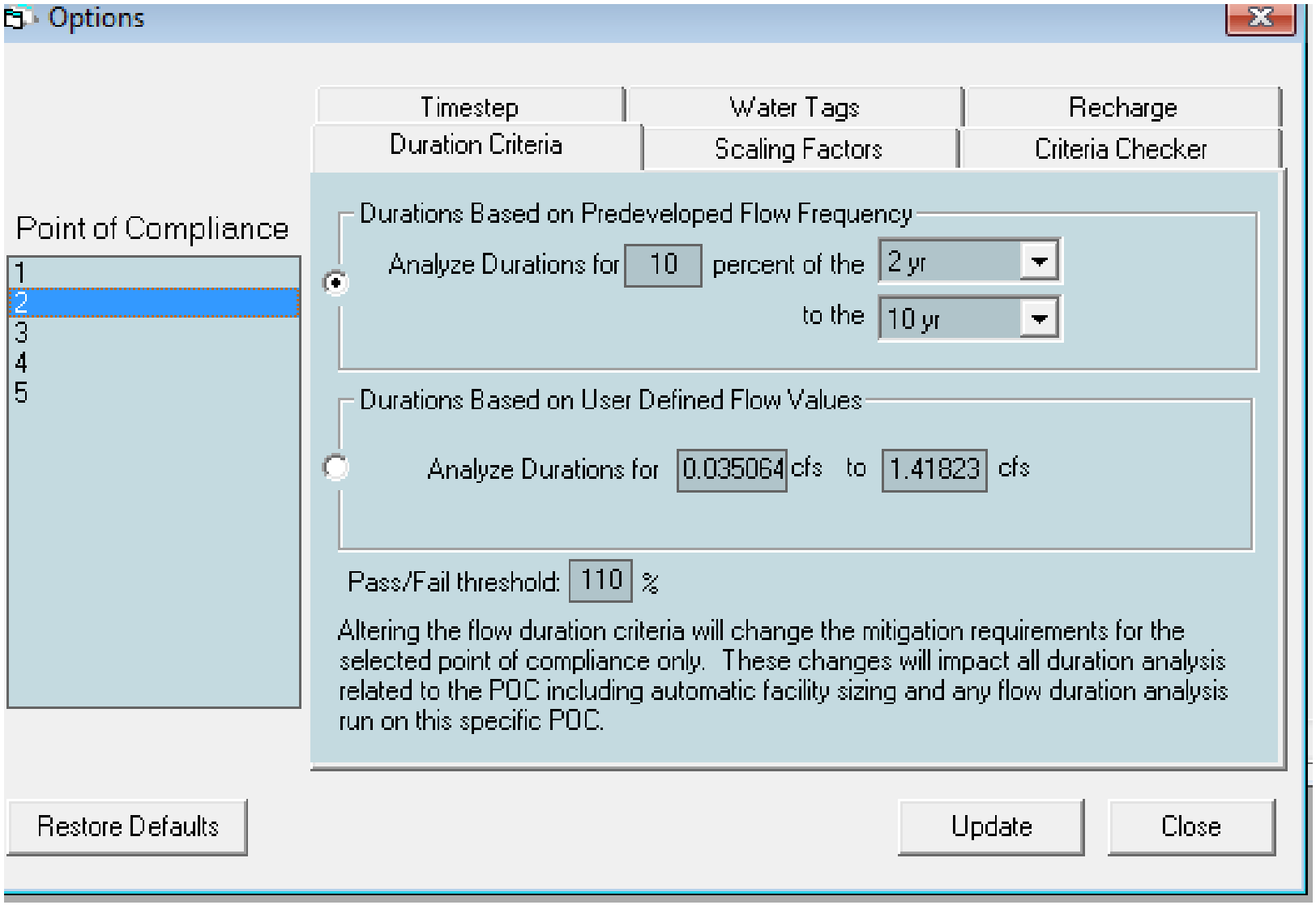
| STORM EVENT | Position | Q (cfs) | 0.1*Q2 (cfs) |
|---|---|---|---|
| Q2 | 20.00 | 1.49 | 0.15 |
| Q3 | 13.33 | 1.98 | |
| Q4 | 10.00 | 2.60 | |
| Q5 | 8.00 | 2.74 | |
| Q6 | 6.67 | 2.82 | |
| Q7 | 5.71 | 2.92 | |
| Q8 | 5.00 | 3.07 | |
| Q9 | 4.44 | 3.11 | |
| Q10 | 4.00 | 3.14 | |
| Q25 | 1.60 | 3.54 | |

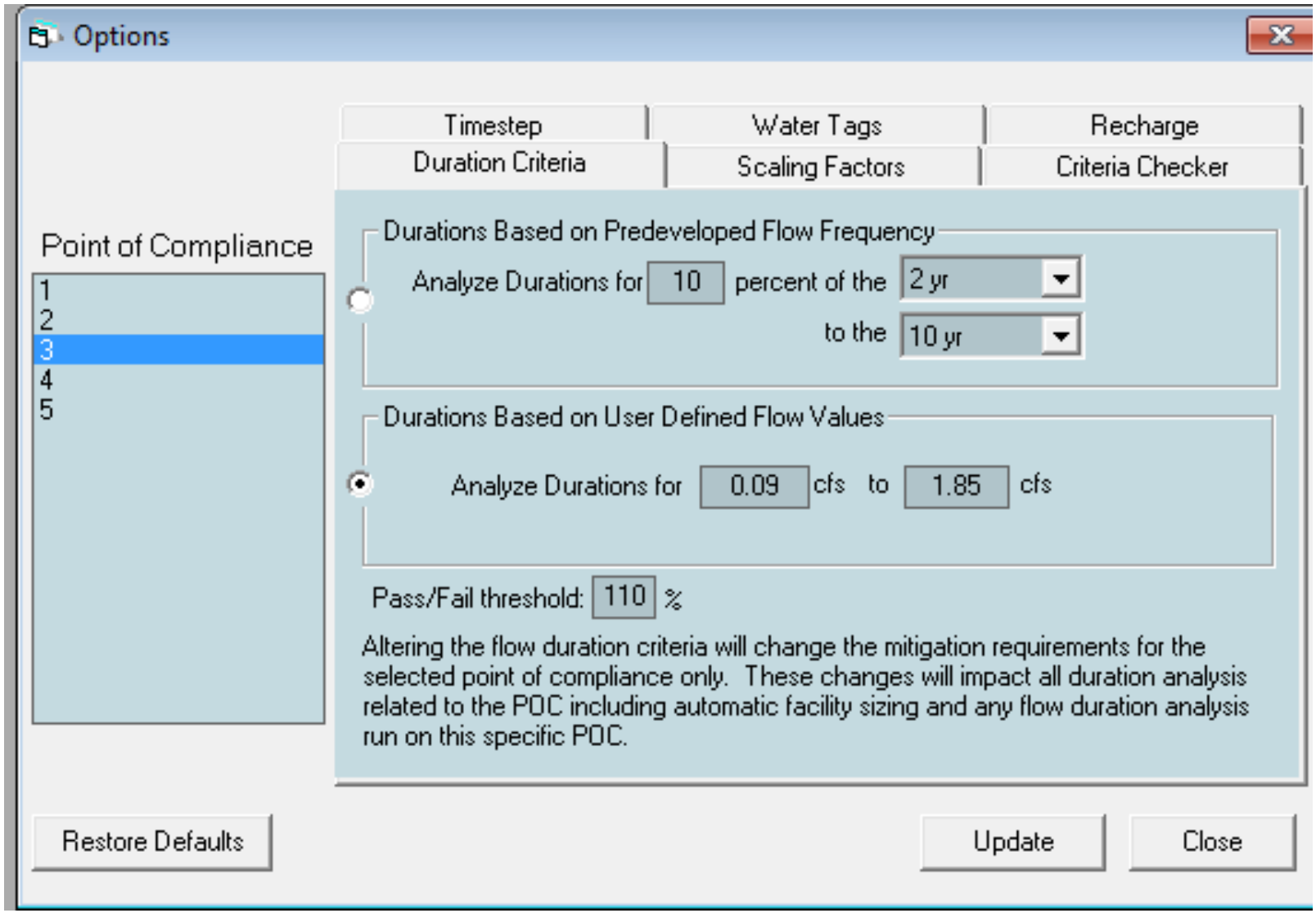


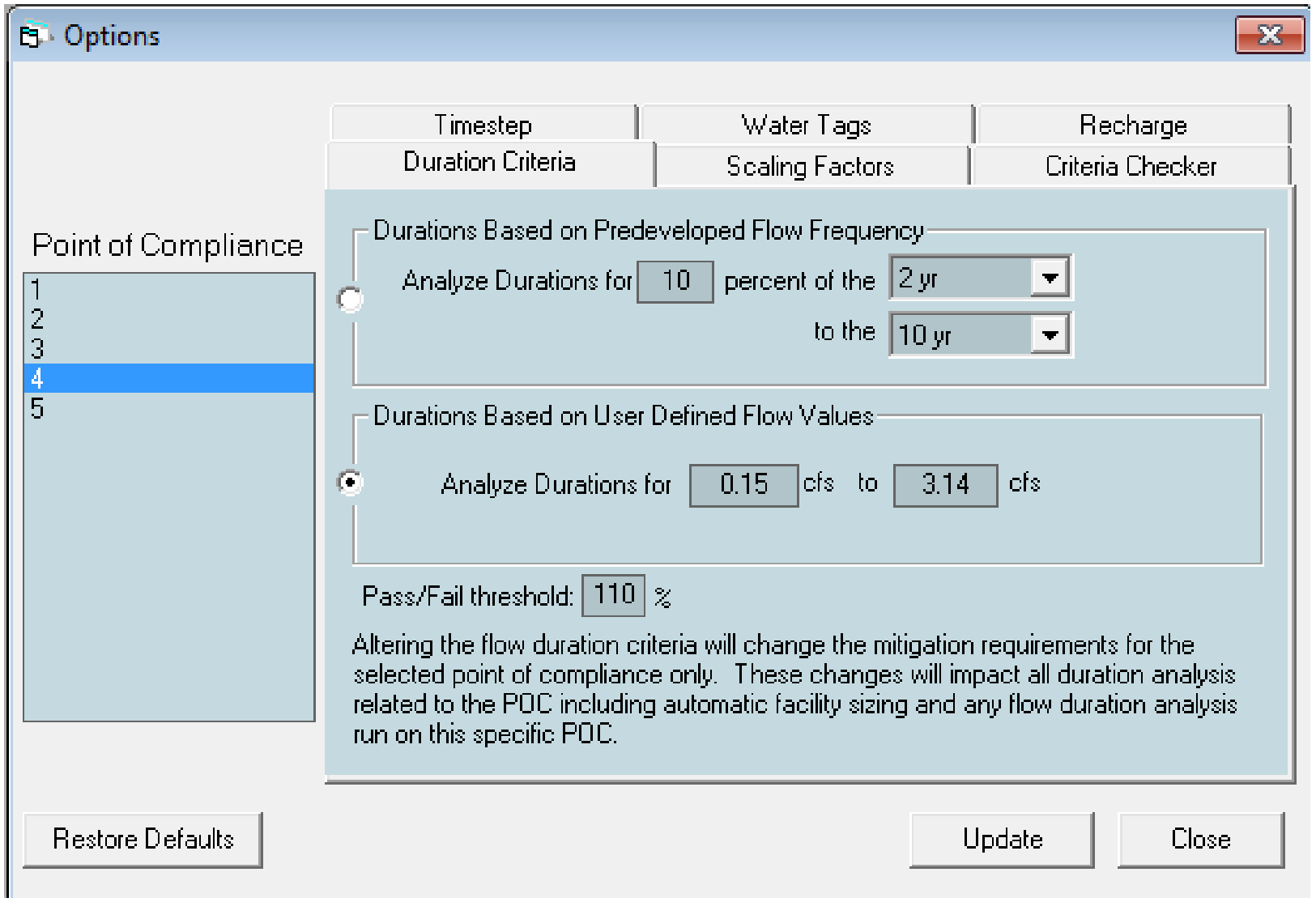
## Appendix 3 – SDHM Hydromodification Results

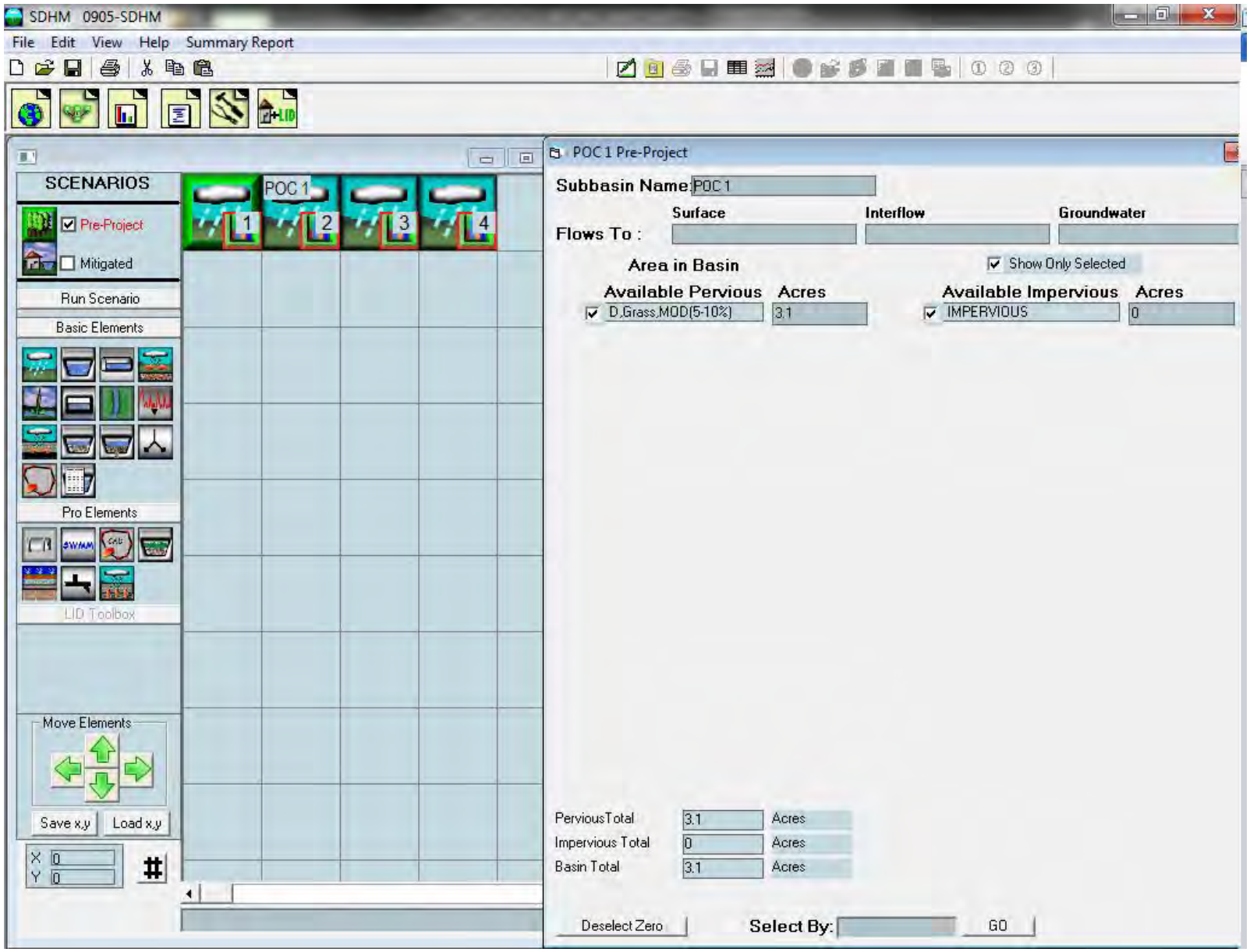

SDHM 0905-SDHM
File Edit View Help Summary Report
San Diego
San Diego
Site Information
Site Name Santa Fe Heights
Address
City
Gage ESCONDID
Precip Factor 1.000
BONITA
BORREGO
LINDBERG
ENCINITA
ESCONDID
FALLBROO
FASHIONV
FLINN SP
KEARNY M
LAKE CUY
LAKE HEN
Map Controls

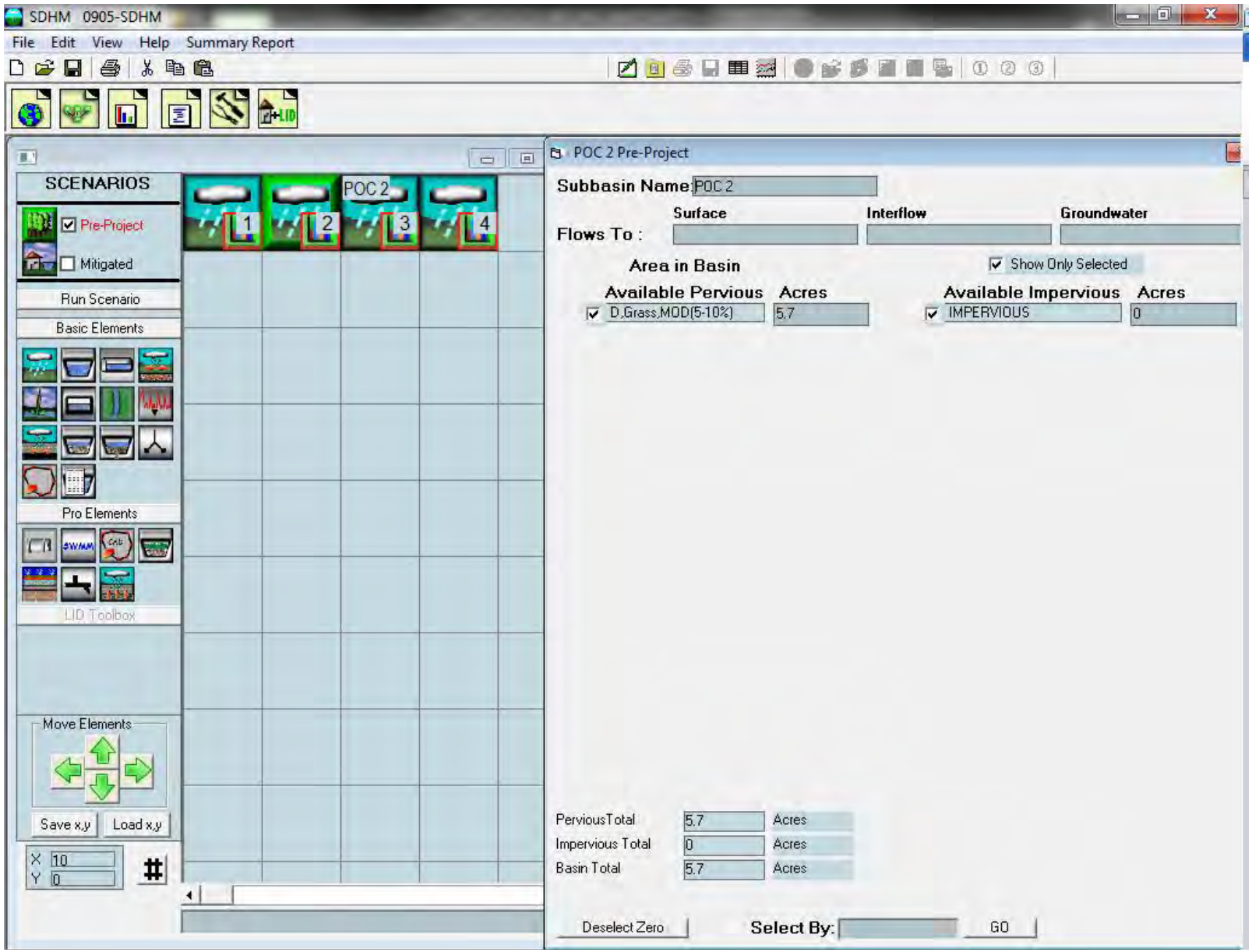

Options
Timestep
Duration Criteria
Water Tags
Scaling Factors
Recharge
Criteria Checker
Point of Compliance
1
2
3
4
5
Durations Based on Predeveloped Flow Frequency
Analyze Durations for 10 percent of the 2 yr
to the 10 yr
Durations Based on User Defined Flow Values
Analyze Durations for 0.06 cfs to 1.41823 cfs
Pass/Fail threshold: 110 %
Altering the flow duration criteria will change the mitigation requirements for the selected point of compliance only. These changes will impact all duration analysis related to the POC including automatic facility sizing and any flow duration analysis run on this specific POC.
Restore Defaults
Update
Close

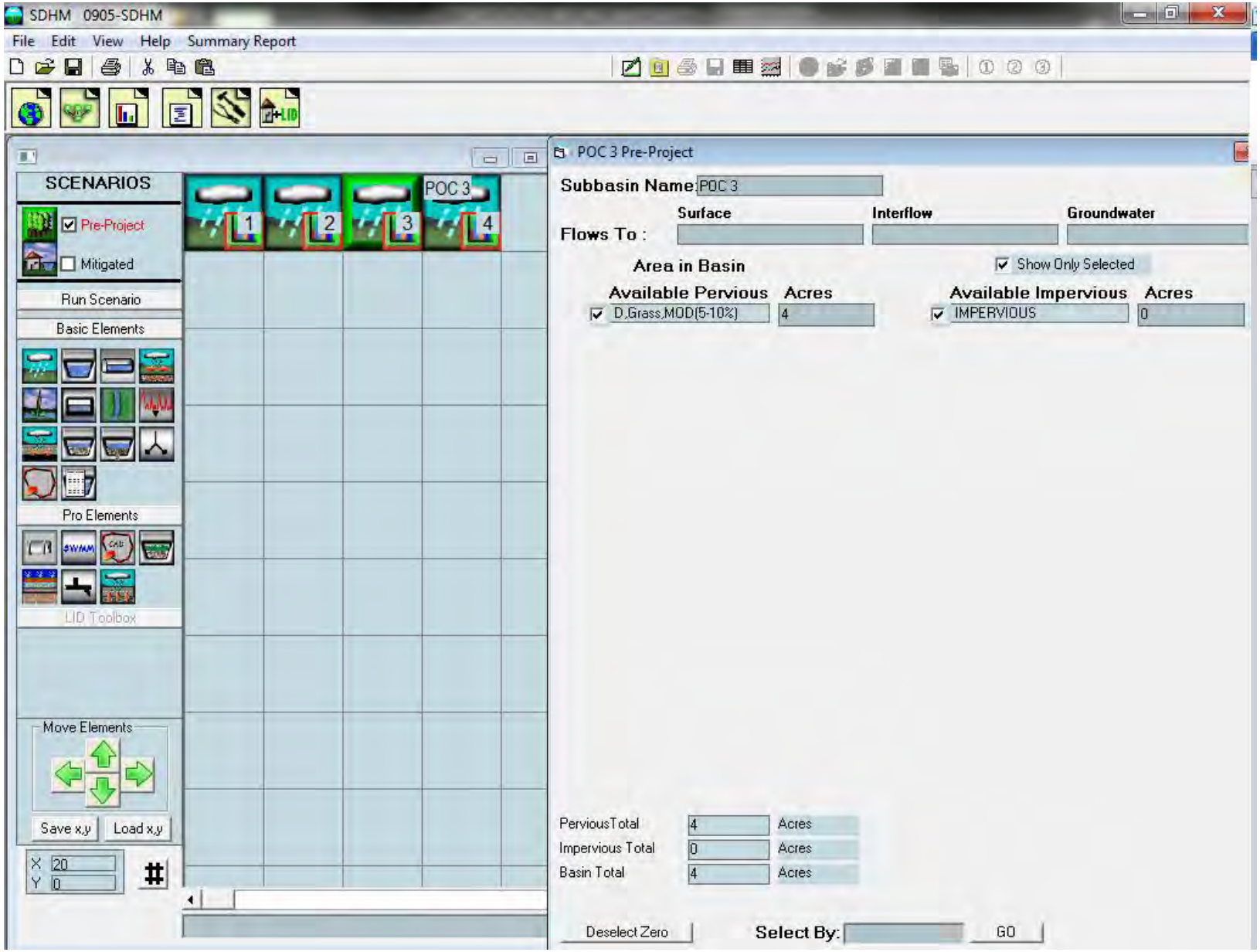

Options
Timestep
Water Tags
Recharge
Duration Criteria
Scaling Factors
Criteria Checker
Point of Compliance
1
2
3
4
5
Durations Based on Predeveloped Flow Frequency
Analyze Durations for 10 percent of the 2 yr
to the 10 yr
Durations Based on User Defined Flow Values
Analyze Durations for 0.035064 cfs to 1.41823 cfs
Pass/Fail threshold: 110 %
Altering the flow duration criteria will change the mitigation requirements for the selected point of compliance only. These changes will impact all duration analysis related to the POC including automatic facility sizing and any flow duration analysis run on this specific POC.
Restore Defaults
Update
Close

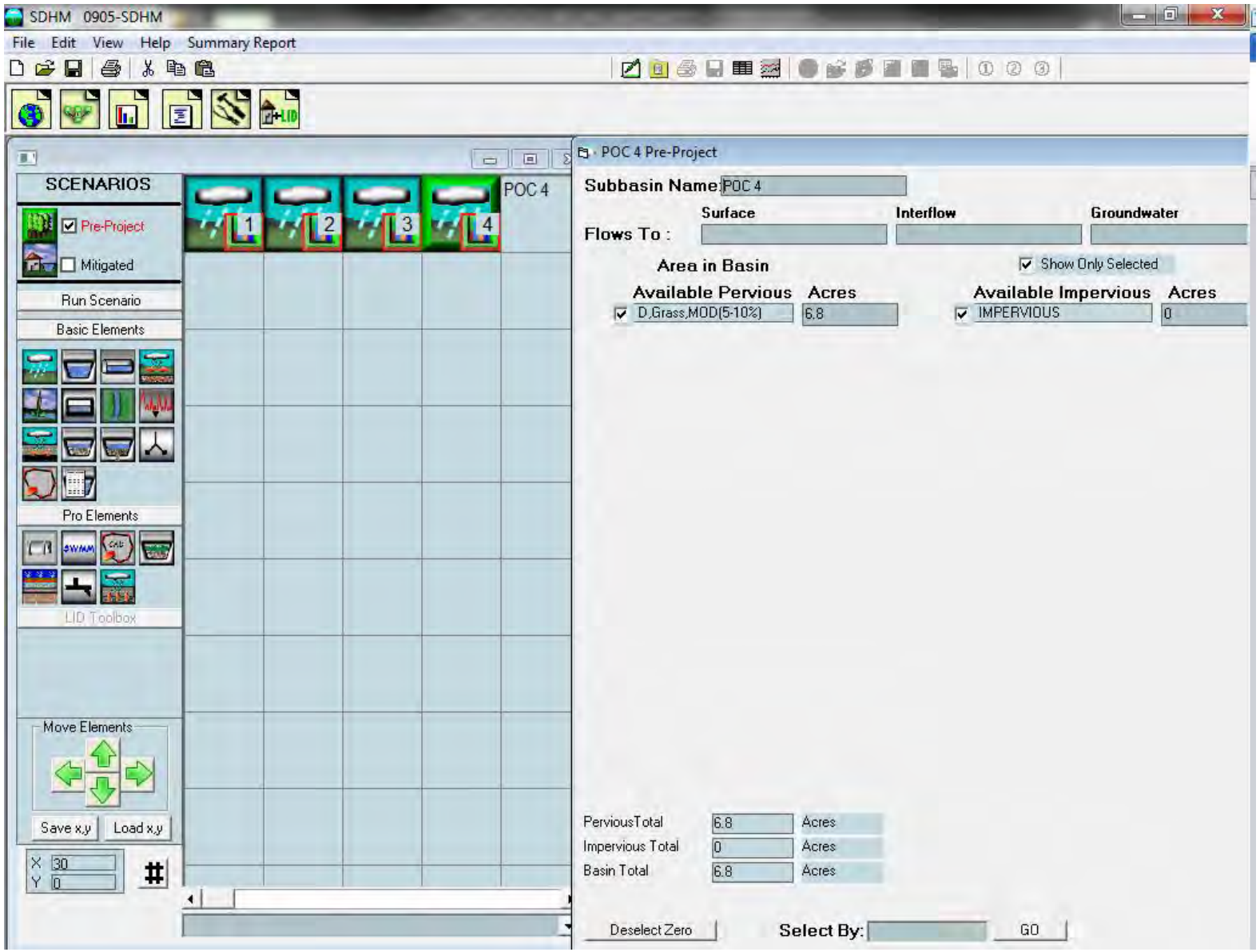

Options
Timestep
Water Tags
Recharge
Duration Criteria
Scaling Factors
Criteria Checker
Point of Compliance
1
2
3
4
5
Durations Based on Predeveloped Flow Frequency
Analyze Durations for 10 percent of the 2 yr
to the 10 yr
Durations Based on User Defined Flow Values
Analyze Durations for 0.09 cfs to 1.85 cfs
Pass/Fail threshold: 110 %
Altering the flow duration criteria will change the mitigation requirements for the selected point of compliance only. These changes will impact all duration analysis related to the POC including automatic facility sizing and any flow duration analysis run on this specific POC.
Restore Defaults
Update
Close

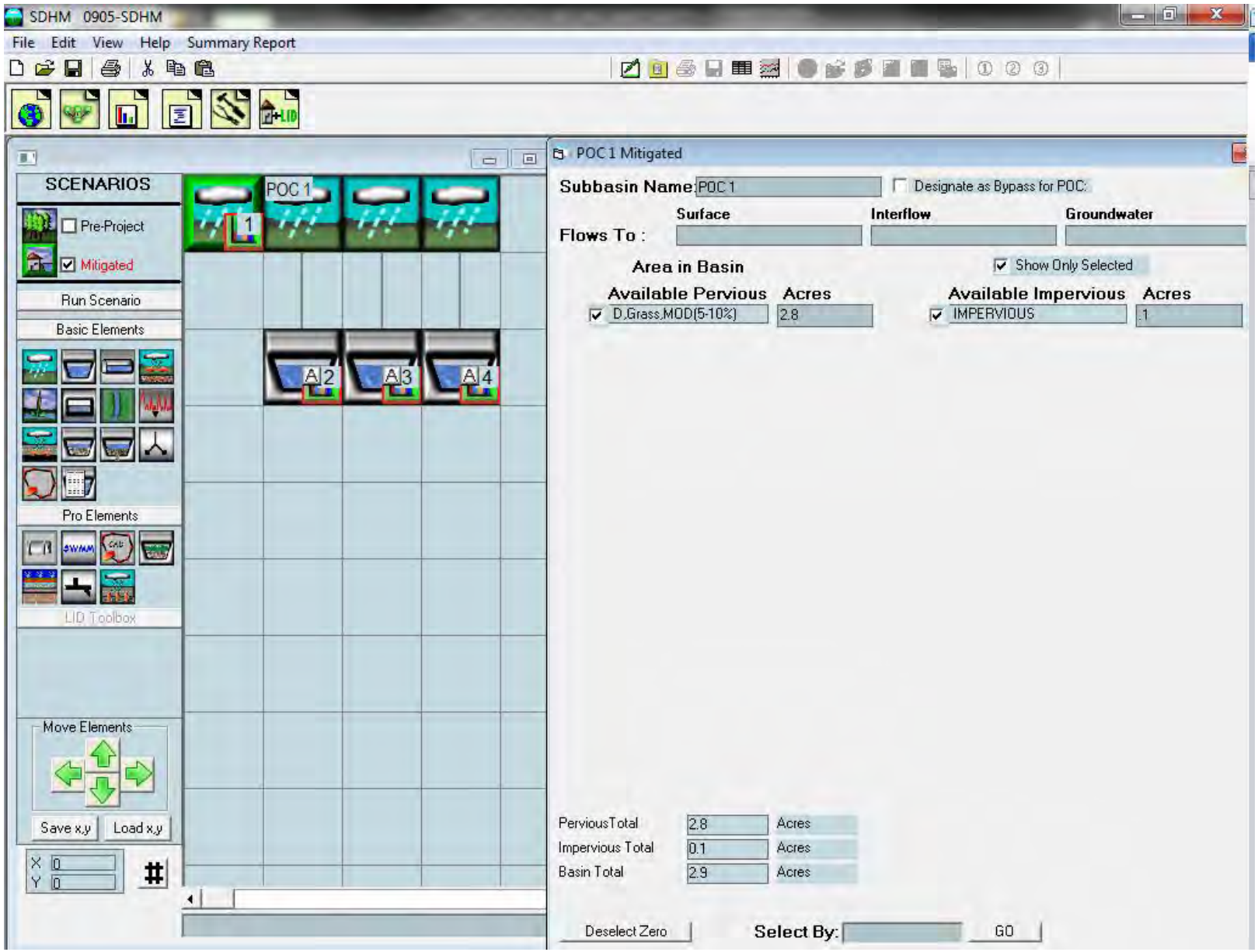

Options
Timestep
Water Tags
Recharge
Duration Criteria
Scaling Factors
Criteria Checker
Point of Compliance
1
2
3
4
5
Durations Based on Predeveloped Flow Frequency
Analyze Durations for 10 percent of the 2 yr
to the 10 yr
Durations Based on User Defined Flow Values
Analyze Durations for 0.15 cfs to 3.14 cfs
Pass/Fail threshold: 110 %
Altering the flow duration criteria will change the mitigation requirements for the selected point of compliance only. These changes will impact all duration analysis related to the POC including automatic facility sizing and any flow duration analysis run on this specific POC.
Restore Defaults
Update
Close

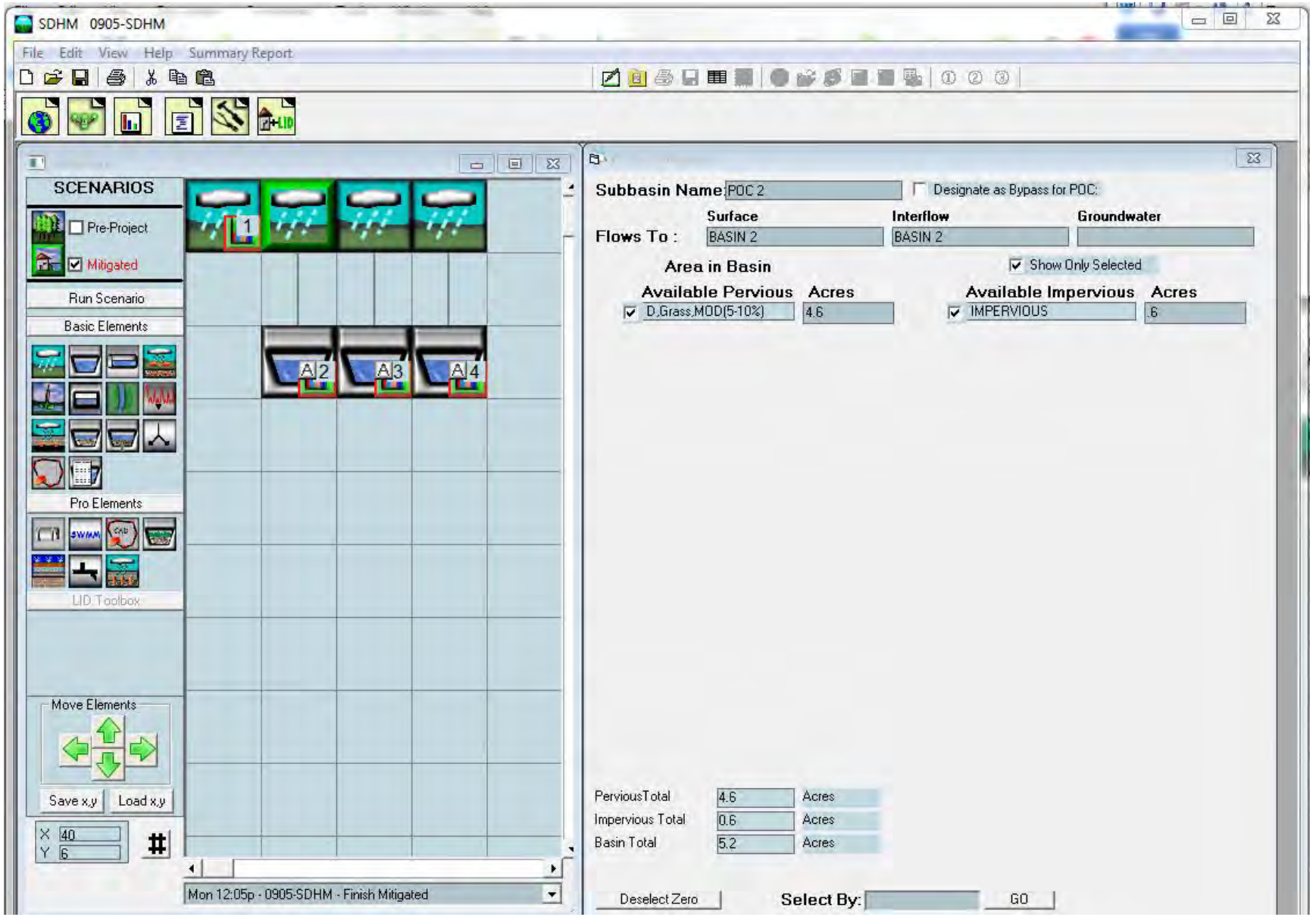

SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 0
Y 0
POC 1
1
2
3
4
POC 1 Pre-Project
Subbasin Name: POC 1
Flows To :
Surface
Interflow
Groundwater
Area in Basin
Show Only Selected
Available Pervious
Acres
D,Grass,MOD(5-10%)
3.1
Available Impervious
Acres
IMPERVIOUS
0
PerviousTotal 3.1 Acres
Impervious Total 0 Acres
Basin Total 3.1 Acres
Deselect Zero
Select By:
GO

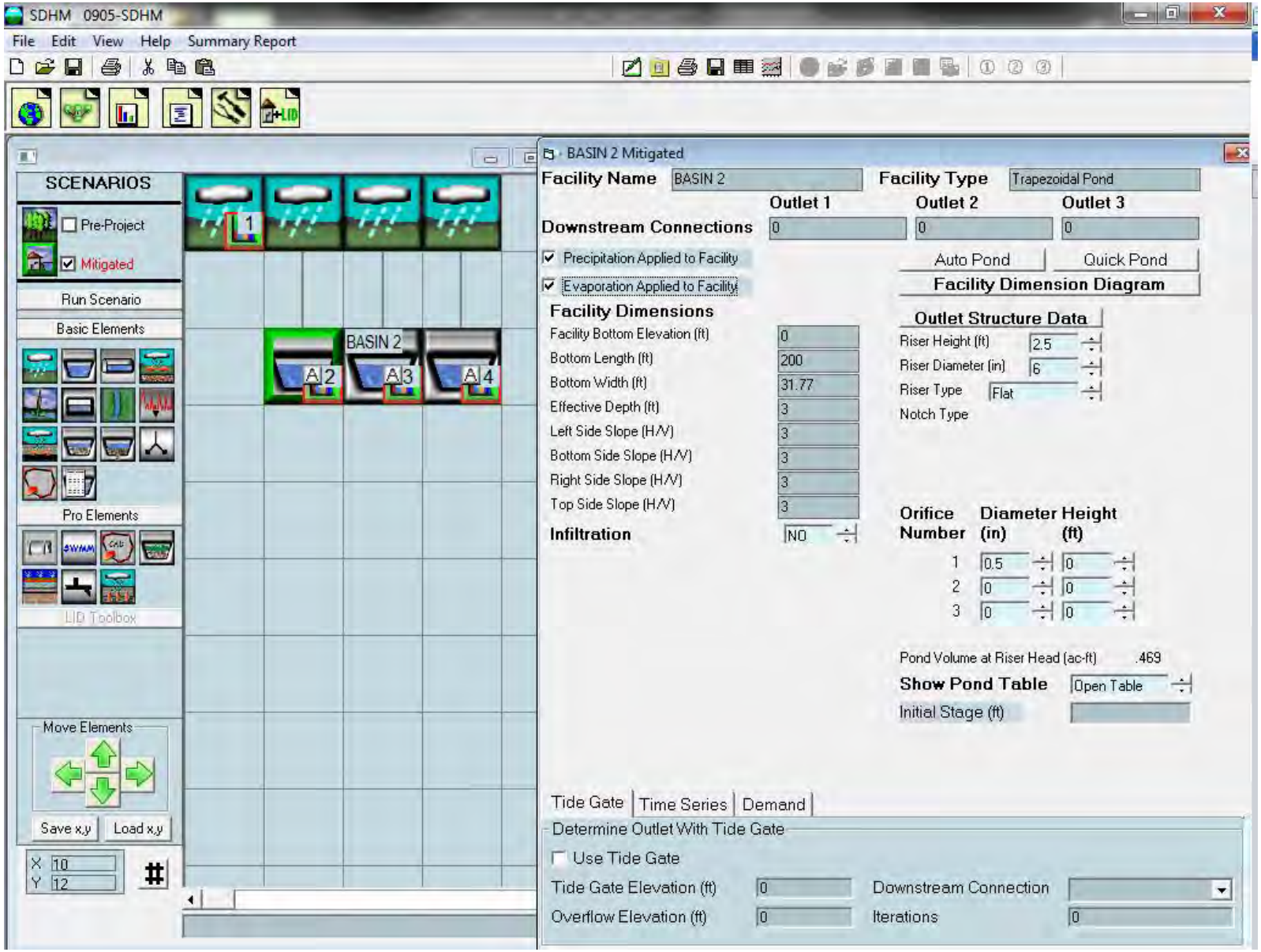

SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 10
Y 0
POC 2
1
2
3
4
POC 2 Pre-Project
Subbasin Name: POC 2
Flows To :
Surface
Interflow
Groundwater
Area in Basin
Show Only Selected
Available Pervious
Acres
D,Grass,MOD(5-10%)
5.7
Available Impervious
Acres
IMPERVIOUS
0
PerviousTotal 5.7 Acres
Impervious Total 0 Acres
Basin Total 5.7 Acres
Deselect Zero
Select By:
GO

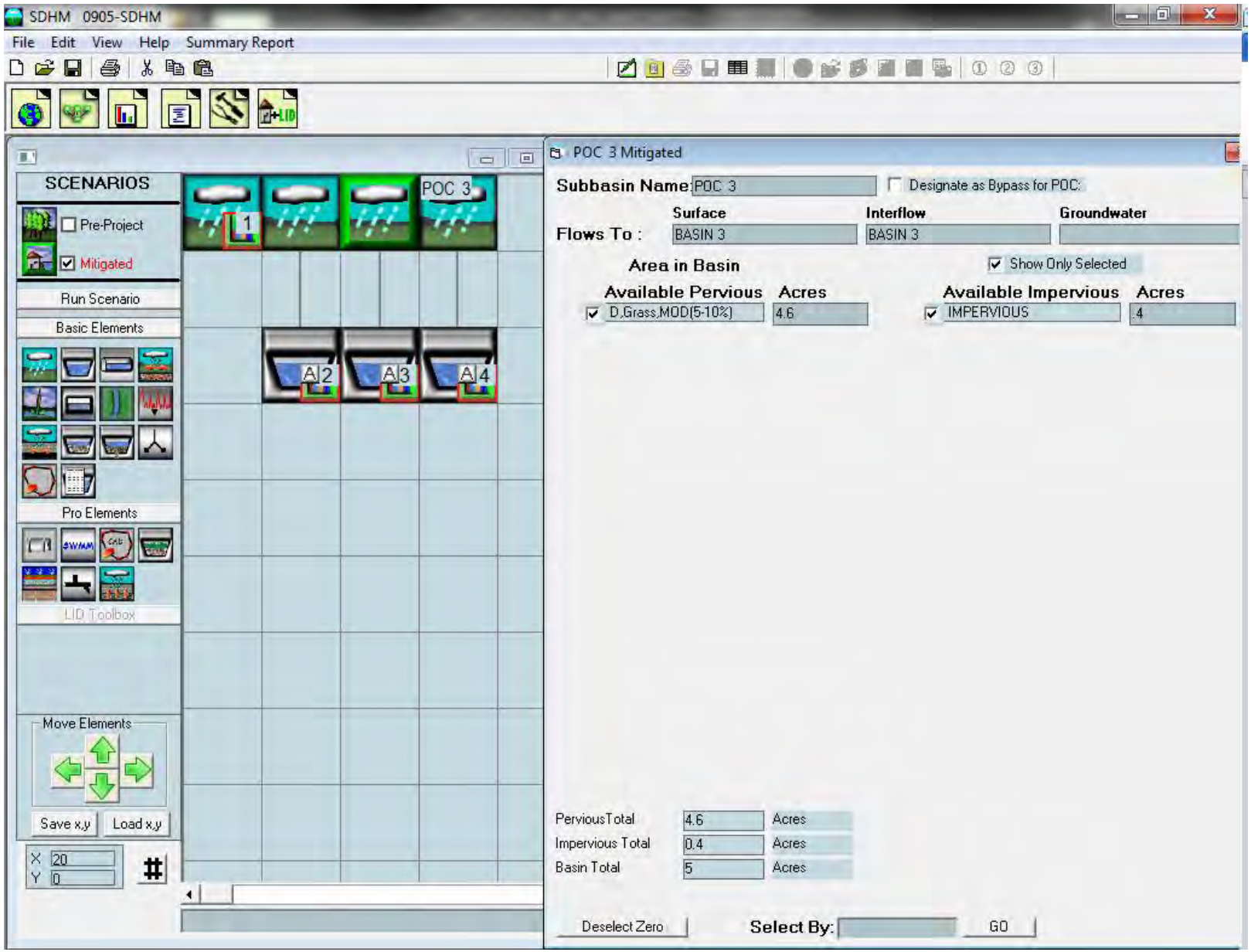

SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 20
Y 0
POC 3
1
2
3
4
POC 3 Pre-Project
Subbasin Name: POC 3
Flows To :
Surface
Interflow
Groundwater
Area in Basin
Show Only Selected
Available Pervious
Acres
D,Grass,MOD(5-10%)
4
Available Impervious
Acres
IMPERVIOUS
0
PerviousTotal 4 Acres
Impervious Total 0 Acres
Basin Total 4 Acres
Deselect Zero
Select By:
GO

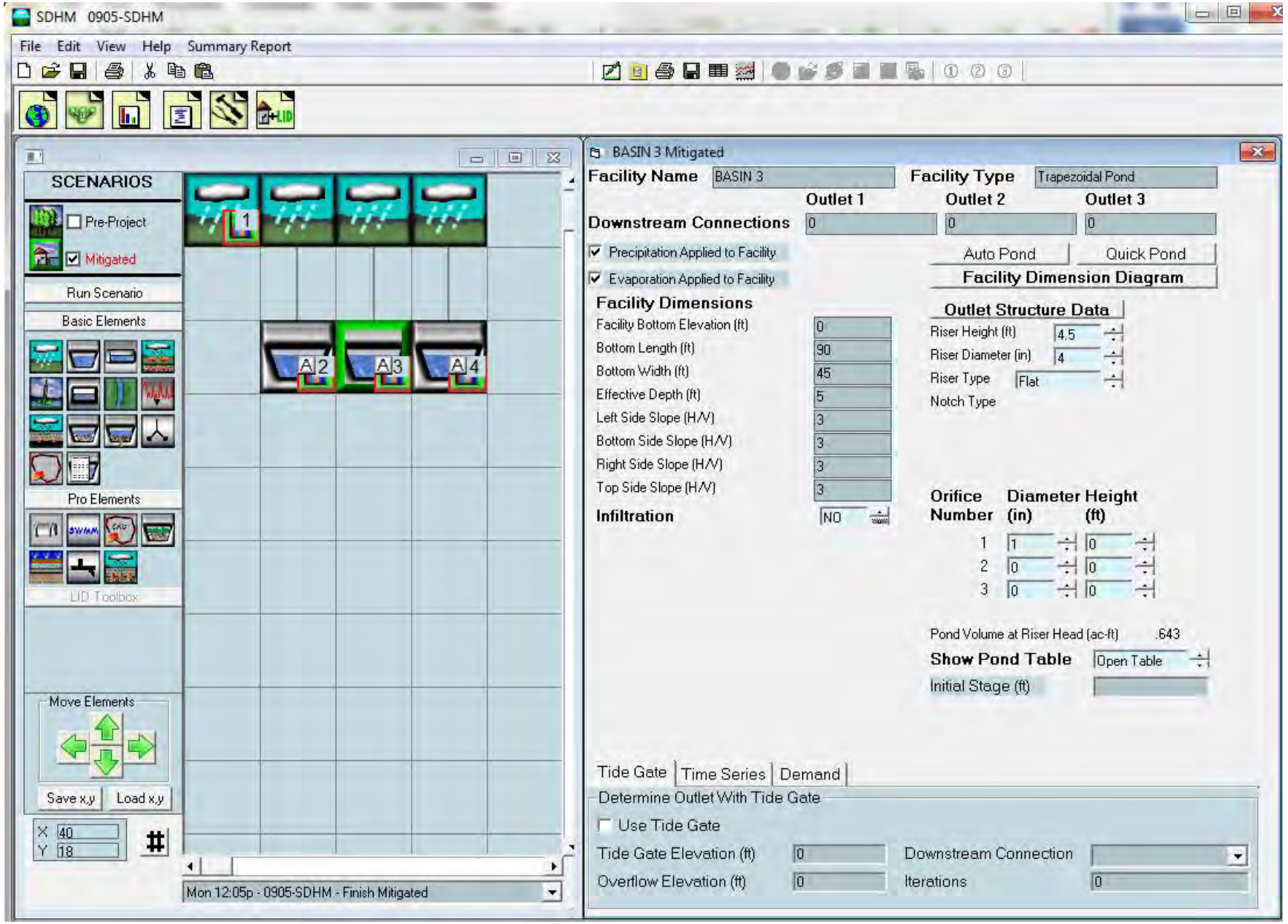

SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 30
Y 0
POC 4
1
2
3
4
POC 4 Pre-Project
Subbasin Name: POC 4
Flows To :
Surface
Interflow
Groundwater
Area in Basin
Show Only Selected
Available Pervious
Acres
D,Grass,MOD(5-10%)
6.8
Available Impervious
Acres
IMPERVIOUS
0
PerviousTotal 6.8 Acres
Impervious Total 0 Acres
Basin Total 6.8 Acres
Deselect Zero
Select By:
GO

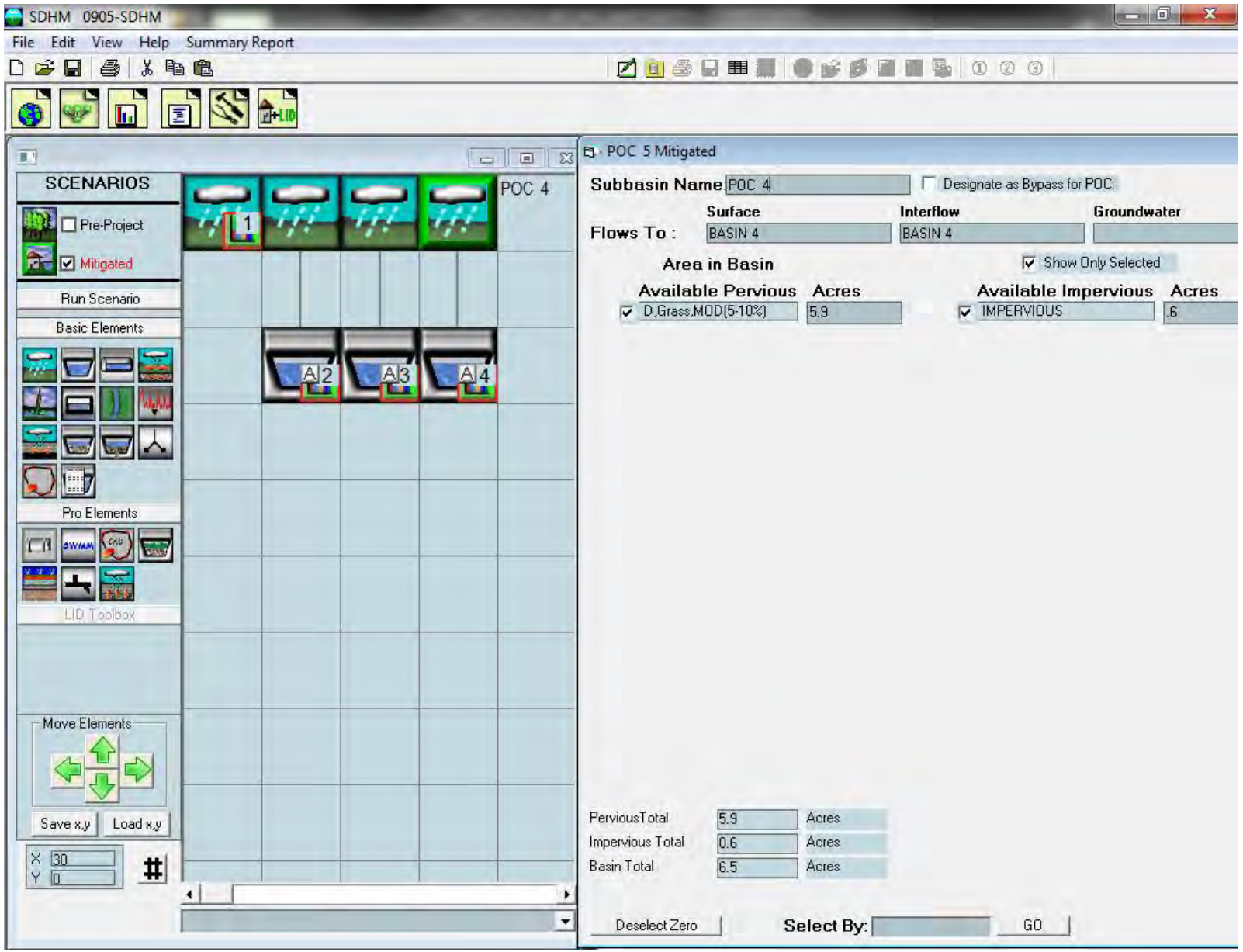

SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 0
Y 0
POC 1
1
A2
A3
A4
POC 1 Mitigated
Subbasin Name: POC 1
Designate as Bypass for POC:
Flows To :
Surface
Interflow
Groundwater
Area in Basin
Show Only Selected
Available Pervious
Acres
D,Grass,MOD(5-10%)
2.8
Available Impervious
Acres
IMPERVIOUS
.1
PerviousTotal 2.8 Acres
Impervious Total 0.1 Acres
Basin Total 2.9 Acres
Deselect Zero
Select By:
GO

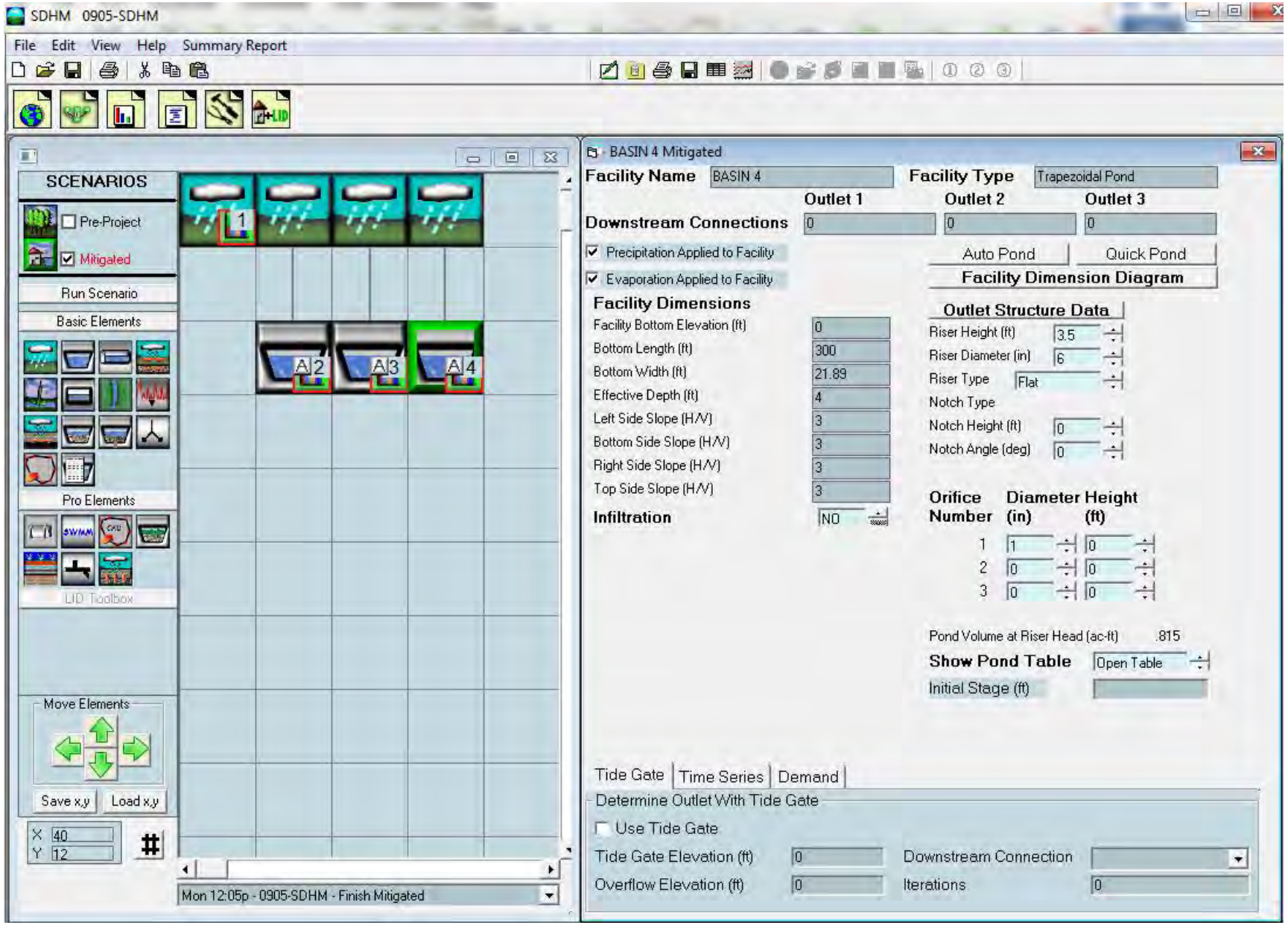

SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 40
Y 6
Mon 12:05p - 0905-SDHM - Finish Mitigated
Subbasin Name: POC 2
Designate as Bypass for POC:
Flows To :
Surface
Interflow
Groundwater
BASIN 2
BASIN 2
Area in Basin
Show Only Selected
Available Pervious
Acres
D,Grass,MOD(5-10%)
4.6
Available Impervious
Acres
IMPERVIOUS
.6
PerviousTotal 4.6 Acres
Impervious Total 0.6 Acres
Basin Total 5.2 Acres
Deselect Zero
Select By:
GO


SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 10
Y 12
BASIN 2
A2
A3
A4
BASIN 2 Mitigated
Facility Name BASIN 2
Facility Type Trapezoidal Pond
Outlet 1
Outlet 2
Outlet 3
Downstream Connections 0 0 0
Precipitation Applied to Facility
Evaporation Applied to Facility
Auto Pond
Quick Pond
Facility Dimension Diagram
Facility Dimensions
Facility Bottom Elevation (ft) 0
Bottom Length (ft) 200
Bottom Width (ft) 31.77
Effective Depth (ft) 3
Left Side Slope (H/V) 3
Bottom Side Slope (H/V) 3
Right Side Slope (H/V) 3
Top Side Slope (H/V) 3
Infiltration NO
Outlet Structure Data
Riser Height (ft) 2.5
Riser Diameter (in) 6
Riser Type Flat
Notch Type
Orifice Number
Diameter (in)
Height (ft)
1 0.5 0
2 0 0
3 0 0
Pond Volume at Riser Head (ac-ft) .469
Show Pond Table Open Table
Initial Stage (ft)
Tide Gate
Time Series
Demand
Determine Outlet With Tide Gate
Use Tide Gate
Tide Gate Elevation (ft) 0
Overflow Elevation (ft) 0
Downstream Connection
Iterations 0

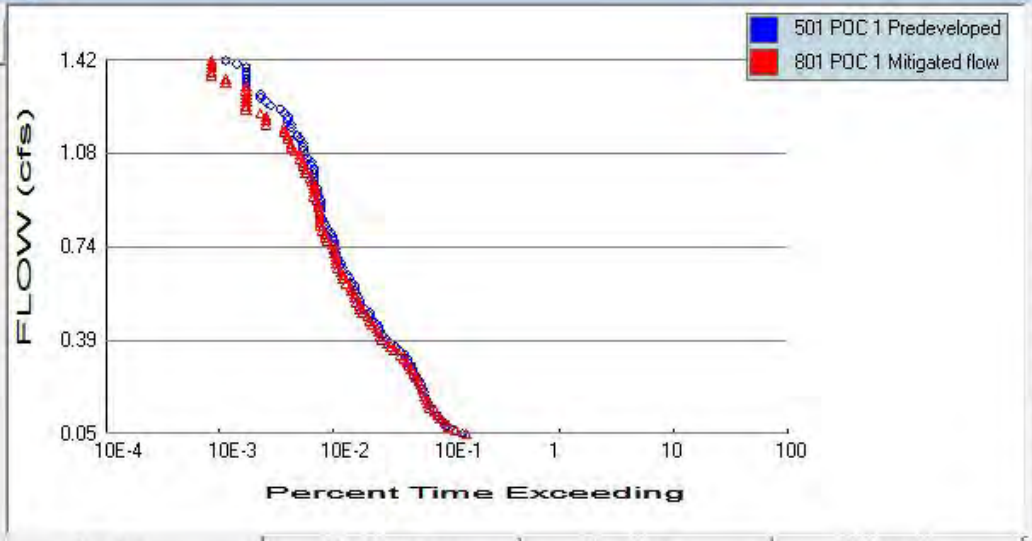

SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 20
Y 0
POC 3
1
A2
A3
A4
POC 3 Mitigated
Subbasin Name: POC 3
Designate as Bypass for POC:
Flows To :
Surface
Interflow
Groundwater
BASIN 3
BASIN 3
Area in Basin
Show Only Selected
Available Pervious
Acres
D,Grass,MOD(5-10%)
4.6
Available Impervious
Acres
IMPERVIOUS
.4
PerviousTotal 4.6 Acres
Impervious Total 0.4 Acres
Basin Total 5 Acres
Deselect Zero
Select By:
GO


SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 40
Y 18
Mon 12:05p - 0905-SDHM - Finish Mitigated
BASIN 3 Mitigated
Facility Name BASIN 3
Facility Type Trapezoidal Pond
Outlet 1 Outlet 2 Outlet 3
Downstream Connections 0 0 0
Precipitation Applied to Facility
Evaporation Applied to Facility
Auto Pond
Quick Pond
Facility Dimension Diagram
Facility Dimensions
Facility Bottom Elevation (ft) 0
Bottom Length (ft) 90
Bottom Width (ft) 45
Effective Depth (ft) 5
Left Side Slope (H/V) 3
Bottom Side Slope (H/V) 3
Right Side Slope (H/V) 3
Top Side Slope (H/V) 3
Infiltration NO
Outlet Structure Data
Riser Height (ft) 4.5
Riser Diameter (in) 4
Riser Type Flat
Notch Type
Orifice Number
Diameter (in)
Height (ft)
1 1 0
2 0 0
3 0 0
Pond Volume at Riser Head (ac-ft) .643
Show Pond Table Open Table
Initial Stage (ft)
Tide Gate
Time Series
Demand
Determine Outlet With Tide Gate
Use Tide Gate
Tide Gate Elevation (ft) 0
Overflow Elevation (ft) 0
Downstream Connection
Iterations 0


SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 30
Y 0
POC 4
1
A2
A3
A4
POC 5 Mitigated
Subbasin Name: POC 4
Designate as Bypass for POC:
Flows To :
Surface
Interflow
Groundwater
BASIN 4
BASIN 4
Area in Basin
Show Only Selected
Available Pervious
Acres
D,Grass,MOD(5-10%)
5.9
Available Impervious
Acres
IMPERVIOUS
.6
PerviousTotal 5.9 Acres
Impervious Total 0.6 Acres
Basin Total 6.5 Acres
Deselect Zero
Select By:
GO


SDHM 0905-SDHM
File Edit View Help Summary Report
SCENARIOS
Pre-Project
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Move Elements
Save x,y
Load x,y
X 40
Y 12
A2
A3
A4
Mon 12:05p - 0905-SDHM - Finish Mitigated
BASIN 4 Mitigated
Facility Name BASIN 4
Facility Type Trapezoidal Pond
Outlet 1 Outlet 2 Outlet 3
Downstream Connections 0 0 0
Precipitation Applied to Facility
Evaporation Applied to Facility
Auto Pond
Quick Pond
Facility Dimension Diagram
Facility Dimensions
Facility Bottom Elevation (ft) 0
Bottom Length (ft) 300
Bottom Width (ft) 21.89
Effective Depth (ft) 4
Left Side Slope (H/V) 3
Bottom Side Slope (H/V) 3
Right Side Slope (H/V) 3
Top Side Slope (H/V) 3
Infiltration NO
Outlet Structure Data
Riser Height (ft) 3.5
Riser Diameter (in) 6
Riser Type Flat
Notch Type
Notch Height (ft) 0
Notch Angle (deg) 0
Orifice Number
Diameter (in)
Height (ft)
1 1 0
2 0 0
3 0 0
Pond Volume at Riser Head (ac-ft) .815
Show Pond Table Open Table
Initial Stage (ft)
Tide Gate
Time Series
Demand
Determine Outlet With Tide Gate
Use Tide Gate
Tide Gate Elevation (ft) 0
Overflow Elevation (ft) 0
Downstream Connection
Iterations 0

Analysis




Durations | Flow Frequency | Drawdown | Hydrograph

Recharge Duration | Recharge Predeveloped | Recharge Mitigated

**Analyze datasets**

501 POC 1 Predeveloped flow
801 POC 1 Mitigated flow

POC 1 | POC 2 | POC 3 | POC 4 | POC 5

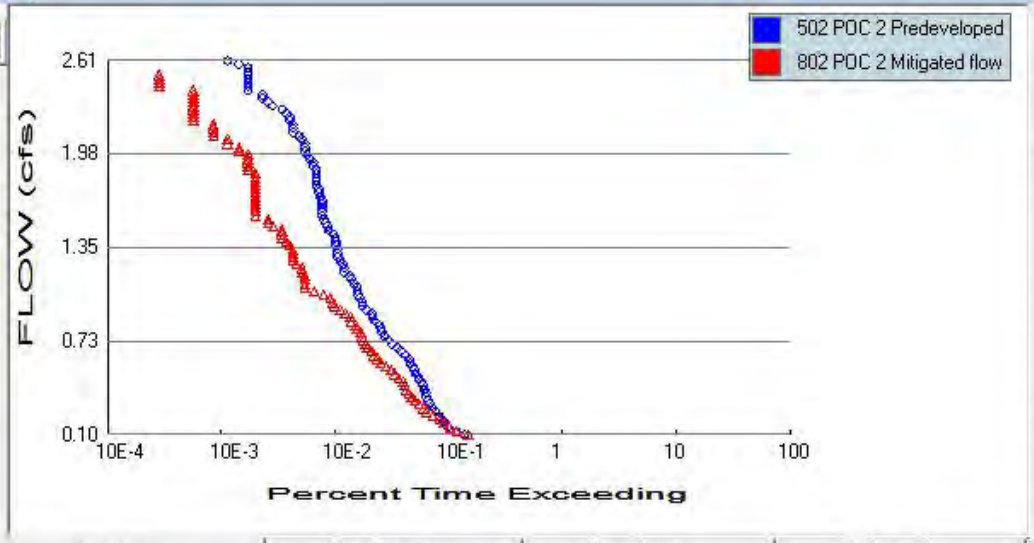
All Datasets | Flow | Stage | Precip | Evap

The Facility PASSED

The Facility PASSED.

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.0534 | 485 | 522 | 107 | Pass |
| 0.0672 | 404 | 421 | 104 | Pass |
| 0.0810 | 350 | 362 | 103 | Pass |
| 0.0948 | 322 | 334 | 103 | Pass |
| 0.1086 | 302 | 306 | 101 | Pass |
| 0.1224 | 287 | 290 | 101 | Pass |
| 0.1361 | 270 | 274 | 101 | Pass |
| 0.1499 | 255 | 252 | 98 | Pass |
| 0.1637 | 241 | 242 | 100 | Pass |
| 0.1775 | 231 | 232 | 100 | Pass |
| 0.1913 | 223 | 224 | 100 | Pass |
| 0.2051 | 222 | 221 | 99 | Pass |
| 0.2189 | 215 | 214 | 99 | Pass |
| 0.2326 | 206 | 206 | 100 | Pass |
| 0.2464 | 200 | 200 | 100 | Pass |
| 0.2602 | 191 | 186 | 97 | Pass |
| 0.2740 | 182 | 179 | 98 | Pass |
| 0.2878 | 175 | 172 | 98 | Pass |
| 0.3016 | 171 | 162 | 94 | Pass |
| 0.3154 | 160 | 157 | 98 | Pass |
| 0.3291 | 156 | 150 | 96 | Pass |
| 0.3429 | 149 | 136 | 91 | Pass |
| 0.3567 | 133 | 122 | 91 | Pass |
| 0.3705 | 123 | 113 | 91 | Pass |
| 0.3843 | 112 | 105 | 93 | Pass |
| 0.3981 | 103 | 95 | 92 | Pass |
| 0.4119 | 97 | 92 | 94 | Pass |
| 0.4256 | 91 | 88 | 96 | Pass |
| 0.4394 | 89 | 85 | 95 | Pass |
| 0.4532 | 86 | 78 | 90 | Pass |
| 0.4670 | 78 | 73 | 93 | Pass |
| 0.4808 | 75 | 71 | 94 | Pass |
| 0.4946 | 73 | 63 | 86 | Pass |

Analysis




Durations | Flow Frequency | Drawdown | Hydrograph

Recharge Duration | Recharge Predeveloped | Recharge Mitigated

**Analyze datasets**

502 POC 2 Predeveloped flow
802 POC 2 Mitigated flow

POC 1 | POC 2 | POC 3 | POC 4 | POC 5

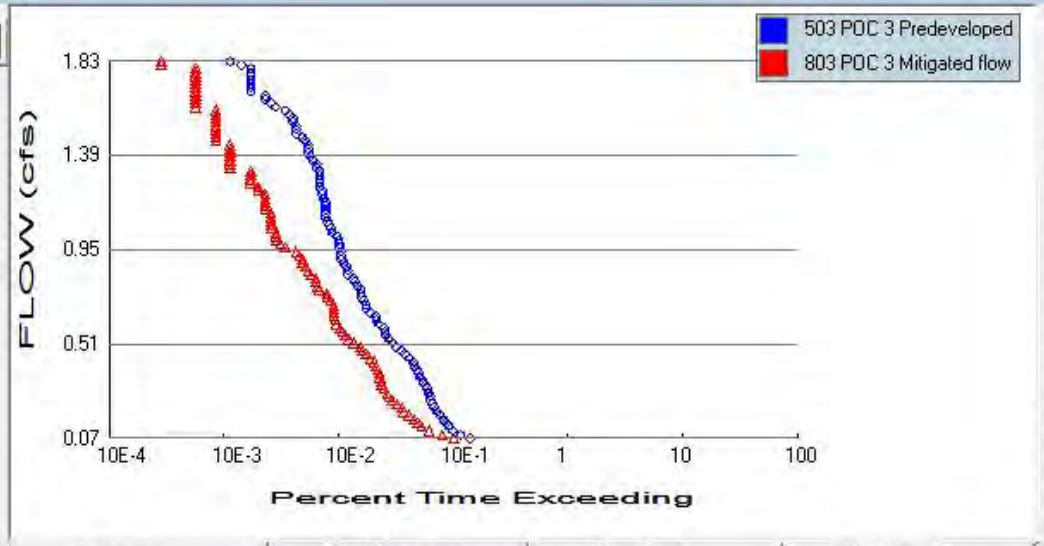
All Datasets | Flow | Stage | Precip | Evap

The Facility PASSED

The Facility PASSED.

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.0982 | 485 | 520 | 107 | Pass |
| 0.1236 | 405 | 412 | 101 | Pass |
| 0.1489 | 351 | 358 | 101 | Pass |
| 0.1743 | 320 | 317 | 99 | Pass |
| 0.1996 | 302 | 290 | 96 | Pass |
| 0.2250 | 287 | 253 | 88 | Pass |
| 0.2503 | 270 | 225 | 83 | Pass |
| 0.2757 | 254 | 210 | 82 | Pass |
| 0.3010 | 241 | 193 | 80 | Pass |
| 0.3264 | 231 | 175 | 75 | Pass |
| 0.3517 | 223 | 165 | 73 | Pass |
| 0.3771 | 222 | 157 | 70 | Pass |
| 0.4024 | 215 | 148 | 68 | Pass |
| 0.4278 | 206 | 143 | 69 | Pass |
| 0.4531 | 200 | 139 | 69 | Pass |
| 0.4785 | 191 | 127 | 66 | Pass |
| 0.5038 | 182 | 118 | 64 | Pass |
| 0.5292 | 175 | 108 | 61 | Pass |
| 0.5545 | 170 | 98 | 57 | Pass |
| 0.5799 | 160 | 88 | 55 | Pass |
| 0.6052 | 156 | 82 | 52 | Pass |
| 0.6306 | 147 | 77 | 52 | Pass |
| 0.6559 | 133 | 73 | 54 | Pass |
| 0.6812 | 123 | 67 | 54 | Pass |
| 0.7066 | 112 | 65 | 58 | Pass |
| 0.7319 | 104 | 62 | 59 | Pass |
| 0.7573 | 96 | 61 | 63 | Pass |
| 0.7826 | 91 | 59 | 64 | Pass |
| 0.8080 | 89 | 54 | 60 | Pass |
| 0.8333 | 86 | 53 | 61 | Pass |
| 0.8587 | 79 | 49 | 62 | Pass |
| 0.8840 | 75 | 48 | 64 | Pass |
| 0.9094 | 73 | 43 | 58 | Pass |

Analysis




Durations | Flow Frequency | Drawdown | Hydrograph

Recharge Duration | Recharge Predeveloped | Recharge Mitigated

**Analyze datasets**

503 POC 3 Predeveloped flow
803 POC 3 Mitigated flow

POC 1 | POC 2 | POC 3 | POC 4 | POC 5

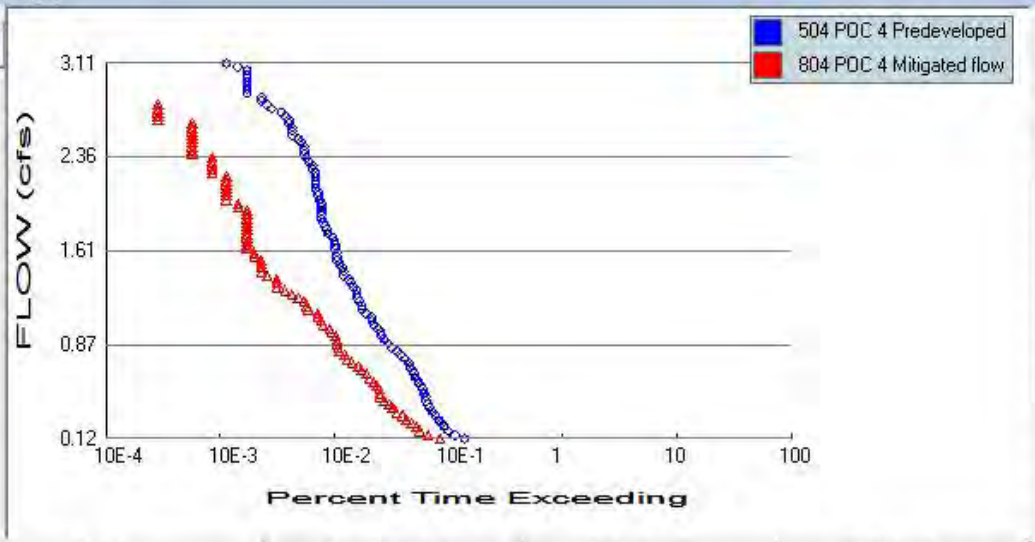
All Datasets | Flow | Stage | Precip | Evap

The Facility PASSED

The Facility PASSED.

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.0689 | 487 | 354 | 72 | Pass |
| 0.0867 | 405 | 281 | 69 | Pass |
| 0.1045 | 350 | 217 | 62 | Pass |
| 0.1223 | 321 | 186 | 57 | Pass |
| 0.1401 | 301 | 171 | 56 | Pass |
| 0.1579 | 287 | 158 | 55 | Pass |
| 0.1757 | 270 | 145 | 53 | Pass |
| 0.1935 | 254 | 130 | 51 | Pass |
| 0.2112 | 241 | 124 | 51 | Pass |
| 0.2290 | 231 | 112 | 48 | Pass |
| 0.2468 | 223 | 102 | 45 | Pass |
| 0.2646 | 222 | 97 | 43 | Pass |
| 0.2824 | 215 | 93 | 43 | Pass |
| 0.3002 | 206 | 87 | 42 | Pass |
| 0.3180 | 200 | 83 | 41 | Pass |
| 0.3358 | 191 | 82 | 42 | Pass |
| 0.3536 | 182 | 80 | 43 | Pass |
| 0.3713 | 175 | 79 | 45 | Pass |
| 0.3891 | 170 | 77 | 45 | Pass |
| 0.4069 | 161 | 74 | 45 | Pass |
| 0.4247 | 156 | 72 | 46 | Pass |
| 0.4425 | 147 | 66 | 44 | Pass |
| 0.4603 | 133 | 61 | 45 | Pass |
| 0.4781 | 123 | 56 | 45 | Pass |
| 0.4959 | 112 | 54 | 48 | Pass |
| 0.5136 | 104 | 48 | 46 | Pass |
| 0.5314 | 97 | 43 | 44 | Pass |
| 0.5492 | 91 | 40 | 43 | Pass |
| 0.5670 | 89 | 38 | 42 | Pass |
| 0.5848 | 87 | 36 | 41 | Pass |
| 0.6026 | 79 | 34 | 43 | Pass |
| 0.6204 | 75 | 33 | 44 | Pass |
| 0.6382 | 73 | 32 | 43 | Pass |

Analysis




Durations | Flow Frequency | Drawdown | Hydrograph

Recharge Duration | Recharge Predeveloped | Recharge Mitigated

**Analyze datasets**

504 POC 4 Predeveloped flow
804 POC 4 Mitigated flow

POC 1 | POC 2 | POC 3 | POC 4 | POC 5

All Datasets | Flow | Stage | Precip | Evap

The Facility PASSED

The Facility PASSED.

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.1172 | 485 | 295 | 60 | Pass |
| 0.1474 | 404 | 232 | 57 | Pass |
| 0.1777 | 350 | 198 | 56 | Pass |
| 0.2079 | 321 | 181 | 56 | Pass |
| 0.2382 | 301 | 165 | 54 | Pass |
| 0.2684 | 287 | 150 | 52 | Pass |
| 0.2986 | 270 | 139 | 51 | Pass |
| 0.3289 | 254 | 123 | 48 | Pass |
| 0.3591 | 241 | 113 | 46 | Pass |
| 0.3894 | 231 | 106 | 45 | Pass |
| 0.4196 | 223 | 96 | 43 | Pass |
| 0.4498 | 222 | 89 | 40 | Pass |
| 0.4801 | 215 | 88 | 40 | Pass |
| 0.5103 | 206 | 87 | 42 | Pass |
| 0.5406 | 200 | 82 | 41 | Pass |
| 0.5708 | 191 | 77 | 40 | Pass |
| 0.6010 | 182 | 71 | 39 | Pass |
| 0.6313 | 175 | 67 | 38 | Pass |
| 0.6615 | 170 | 60 | 35 | Pass |
| 0.6918 | 160 | 57 | 35 | Pass |
| 0.7220 | 156 | 50 | 32 | Pass |
| 0.7522 | 147 | 45 | 30 | Pass |
| 0.7825 | 133 | 43 | 32 | Pass |
| 0.8127 | 123 | 39 | 31 | Pass |
| 0.8430 | 112 | 38 | 33 | Pass |
| 0.8732 | 103 | 37 | 35 | Pass |
| 0.9034 | 97 | 37 | 38 | Pass |
| 0.9337 | 91 | 36 | 39 | Pass |
| 0.9639 | 89 | 33 | 37 | Pass |
| 0.9942 | 85 | 32 | 37 | Pass |
| 1.0244 | 78 | 28 | 35 | Pass |
| 1.0546 | 75 | 27 | 36 | Pass |
| 1.0849 | 73 | 25 | 34 | Pass |

## Appendix 4 – Drawdown Calculations

# Drawdown Calculations

1) Using precipitation for the 10 year storm ($P_{10}$) and the Runoff Coefficient for Natural Land (C) and given tributary areas, determine volume ($V_{10}$) of the 10 year storm:
   $V_{10} = P_{10}*C*Area$
   $P_{10} = 2$ in
   $C = 0.35$
2) Using $V_{10}$ and pond geometry, determine depth of ponding

| | Tributary Area (ac) | $V_{10}$ (ac-ft) | Ponding Depth (ft) |
|---|---|---|---|
| Pond 2 | 5.2 | 0.3 | 1.73 |
| Pond 3 | 5.0 | 0.3 | 2.45 |
| Pond 4 | 6.5 | 0.4 | 1.91 |

3) Calculate volume at incremental depths, per pond geometry
4) Calculate $Q_{out}$, and Total Drawdown Time at incremental depths

| POND 2 DRAWDOWN CALCULATIONS | | | |
|---|---|---|---|
| | | | |
| ORIFICE EQUATION $Q = C*A*(2gD)^{0.5}$ | | | |
| DRAWDOWN TIME (HR) = ($\Sigma$ ($\Delta V$/Qavg/3600)) | | | |
| Qout = | C*A*(2gD)^0.5 | | |
| D (ft) | Ponding depth | | |
| Orifice Coefficient C | 0.67 | | |
| Outlet diameter (in) | 1 | | |
| Outlet Area A (sq ft) | 0.01 | | |
| g (ft/s^2) | 32.2 | | |
| | | | |
| Ponding Depth (FT) | Qout (CFS) | V in basin (CU FT) | Total Drawdown Time (HR) |
| 2.00 | 0.00 | 8,903 | 0.0 |
| 1.73 | 0.04 | 8,441 | 6.6 |
| 1.50 | 0.04 | 8,048 | 9.6 |
| 1.00 | 0.03 | 7,194 | 16.8 |
| 0.50 | 0.02 | 3,597 | 56.8 |
| 0.00 | 0.00 | 0 | 153.1 |